**高被引论文：**

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标题: Implications of the in situ stress distribution for coalbed methane zonation and hydraulic fracturing in multiple seams, western Guizhou, China

作者: Chen, SD (Chen, Shida); Tang, DZ (Tang, Dazhen); Tao, S (Tao, Shu); Liu, PC (Liu, Pengcheng); Mathews, JP (Mathews, Jonathan P.)

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摘要: With 59 sets of well testing data from 32 wells, 70 coal seam gas data from 9 wells, and production data from 17 wells, the in situ stress distribution within depths of 136-1244 m and its implications for coal permeability (0.0001-1.56 mD), gas content (5-22 m3/t) and gas productivity in western Guizhou were investigated. Three major depth intervals with different stress regimes were identified. At depths of 800-1244 m, the horizontal stresses increased to high values with depth due to the compressional zone near the axis of the syncline. Permeability changes with depth were consistent with the effective stress variations. The 500-800 m depth interval with a normal faulting stress regime was favorable for good permeability (0.008-0.57 mD, mean 0.2 mD) and a stable pressure gradient (approximately 1 MPa/100 m), and the gas content generally increased with depth to a peak value at 800 m. For the 200-500 m and 800-1244 m depth intervals, extremely low permeability (0.0001-0.17 mD, mean 0.03 mD) resulted in discontinuous changes in gas content and pressure gradient (0.471.71 MPa/100 m). Overall, the stress release zone at depths of 500-800 m was favorable for coalbed methane extraction, which agreed with the measured production data. Low horizontal stress anisotropy in western Guizhou contributes to complex hydraulic fracture networks, individual seam fracturing with low proppant concentration and high fracturing fluid volume is suggested for multilayer commingled production.

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作者关键词: In situ stress; Permeability; Gas distribution; Productivity; Hydraulic fracture; Depth

KeyWords Plus: DEPENDENT PERMEABILITY; LABORATORY MEASUREMENT; SEDIMENTARY CONTROL; HORIZONTAL STRESS; CBM DEVELOPMENT; BEARING SYSTEM; PORE PRESSURE; ORDOS BASIN; RESERVOIR; PROVINCE

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标题: Recent advances on Bi2WO6-based photocatalysts for environmental and energy applications

作者: Chen, T (Chen, Tong); Liu, LZ (Liu, Lizhen); Hu, C (Hu, Cheng); Huang, HW (Huang, Hongwei)

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摘要: Bismuth tungstate (Bi2WO6) has become a research hotspot due to its potential in photocatalytic energy conversion and environmental purification. Nevertheless, the limited light absorption and fast recombination of photogenerated carriers hinder the further improvement of the photocatalytic performance of Bi2WO6. Herein, we provide a systematic review for the recent advances on Bi2WO6-based photocatalysts. It starts with the crystal structure, optical properties and photocatalytic fundamentals of Bi2WO6. Then, we focus on the modification strategies of Bi2WO6 based on morphology control, atomic modulation and composite fabrication for diverse photocatalytic applications, such as organic synthesis, water splitting, CO2 reduction, water treatment, air purification, bacterial inactivation, etc. Finally, some current challenges and future development prospects are proposed. We expect that this review can provide a useful reference and guidance for the development of efficient Bi2WO6 photocatalysts. (C) 2021, Dalian Institute of Chemical Physics, Chinese Academy of Sciences. Published by Elsevier B.V. All rights reserved.

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文献类型: Review

作者关键词: Bi2WO6; Photocatalyst Morphology control; Atomic modulation; Composite fabrication

KeyWords Plus: GRAPHITIC CARBON NITRIDE; EFFICIENT CHARGE SEPARATION; DOPED TIO2 PHOTOCATALYST; C-H BONDS; VISIBLE-LIGHT; ULTRATHIN NANOSHEETS; HYDROGEN EVOLUTION; BISMUTH TUNGSTATE; HIGHLY EFFICIENT; GRAPHENE OXIDE

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标题: Spectral-Spatial Weighted Kernel Manifold Embedded Distribution Alignment for Remote Sensing Image Classification

作者: Dong, YN (Dong, Yanni); Liang, TY (Liang, Tianyang); Zhang, YX (Zhang, Yuxiang); Du, B (Du, Bo)

来源出版物: IEEE TRANSACTIONS ON CYBERNETICS 卷: 51 期: 6 页: 3185-3197 DOI: 10.1109/TCYB.2020.3004263 出版年: JUN 2021

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摘要: Feature distortions of data are a typical problem in remote sensing image classification, especially in the area of transfer learning. In addition, many transfer learning-based methods only focus on spectral information and fail to utilize spatial information of remote sensing images. To tackle these problems, we propose spectral-spatial weighted kernel manifold embedded distribution alignment (SSWK-MEDA) for remote sensing image classification. The proposed method applies a novel spatial information filter to effectively use similarity between nearby sample pixels and avoid the influence of nonsample pixels. Then, a complex kernel combining spatial kernel and spectral kernel with different weights is constructed to adaptively balance the relative importance of spectral and spatial information of the remote sensing image. Finally, we utilize the geometric structure of features in manifold space to solve the problem of feature distortions of remote sensing data in transfer learning scenarios. SSWK-MEDA provides a novel approach for the combination of transfer learning and remote sensing image characteristics. Extensive experiments have demonstrated that the proposed method is more effective than several state-of-the-art methods.

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作者关键词: Remote sensing; Kernel; Manifolds; Distortion; Support vector machines; Principal component analysis; Learning systems; Classification; Grassmann manifold; remote sensing; spatial and spectral information; transfer learning; weighted kernel

KeyWords Plus: DOMAIN-ADAPTATION; NEURAL-NETWORKS

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标题: Polynomial-Type Lyapunov-Krasovskii Functional and Jacobi-Bessel Inequality: Further Results on Stability Analysis of Time-Delay Systems

作者: Huang, YB (Huang, Yi-Bo); He, Y (He, Yong); An, JQ (An, Jianqi); Wu, M (Wu, Min)

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摘要: To derive a less conservative stability criterion via Lyapunov-Krasovskii functional (LKF) method, in previous literature, multiple integral terms are usually introduced into the construction of LKFs. This article generalizes the results of previous literature by proposing a polynomial-type LKF, which contains the LKFs with multiple integral terms as special cases. In addition, a Jacobi-Bessel inequality is presented to bound the derivative of such LKF. As a result, an improved stability criterion of time-delay systems is established. Finally, two numerical examples are given to illustrate the effectiveness, and advantages of our method.

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作者关键词: Stability criteria; Delays; Numerical stability; Symmetric matrices; Integral equations; Jacobian matrices; Integral inequality; multiple integral term; stability analysis; time-delay system

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标题: Bifurcation and stability of a two-species reaction-diffusion-advection competition model

作者: Ma, L (Ma, Li); Guo, SJ (Guo, Shangjiang)

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摘要: This paper is concerned with the dynamics of a two-species reaction-diffusion-advection competition model subject to the no-flux boundary condition in a bounded domain. By the signs of the associated principal eigenvalues, we derive the existence and local stability of the trivial and semi-trivial steady-state solutions. Moreover, the nonexistence and existence of the coexistence steady-state solutions stemming from the two boundary steady states are obtained as well. In particular, we describe the feature of the coincidence of bifurcating coexistence steady-state solution branches. At the same time, the effect of advection on the stability of the bifurcating solution is also investigated, and our results suggest that the advection term may change the stability. Finally, we point out that the methods we applied here are mainly based on spectral analysis, perturbation theory, comparison principle, monotone theory, Lyapunov-Schmidt reduction, and bifurcation theory. (C) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Reaction-diffusion-advection; Biparametric bifurcation; Perturbation theory; Coexistence solution; Lyapunov-Schmidt reduction

KeyWords Plus: STEADY-STATES; SPATIOTEMPORAL PATTERNS; SPATIAL VARIATION; SYSTEM; EIGENVALUE; EQUATIONS

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标题: Geohazards and human settlements: Lessons learned from multiple relocation events in Badong, China - Engineering geologist's perspective

作者: Gong, WP (Gong, Wenping); Juang, CH (Juang, C. Hsein); Wasowski, J (Wasowski, Janusz)

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摘要: Mountainous regions are inherently susceptible to geohazards, such as landslides and debris flows, with the threat of natural disasters compounded by human activities (mainly settlements). Lessons learned from past events that involved the interactions between human activities and geohazards are helpful for future site selections of human settlements in mountainous regions. To this end, the events associated with county seat relocations in Badong, a typical county in the Three Gorges Reservoir region, China, are studied from an engineering geologist's perspective. Over its history, the county seat was relocated multiple times, with the first relocation traced back to the Song dynasty (960-1279 CE) and the last two relocations linked to the Three Gorges Dam project. By studying geohazards and their interactions with human activities in these county-seat relocations, and through the reconstruction of these events, we secure insights into decision-making for these events. As part of the reconstruction of these relocation events, we analyze a giant pre-historic landslide, whose discovery ultimately prompted the third relocation. Using the case history of this landslide, we also discuss and emphasize the importance of proactive monitoring of geohazards for disaster resilience enhancement, recognizing that our knowledge of nature is vastly incomplete.

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语言: English

文献类型: Article

作者关键词: Geohazard; Human settlement; Landslide; Mountainous region; Three Gorges Reservoir

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标题: Recognition of a Middle-Late Jurassic arc-related porphyry copper belt along the southeast China coast: Geological characteristics and metallogenic implications

作者: Mao, JW (Mao, Jingwen); Zheng, W (Zheng, Wei); Xie, GQ (Xie, Guiqing); Lehmann, B (Lehmann, Bernd); Goldfarb, R (Goldfarb, Richard)

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摘要: Recent exploration has led to definition of a Middle-Late Jurassic copper belt with an extent of similar to 2000 km along the southeast China coast. The 171-153 Ma magmatic-hydrothermal copper systems consist of porphyry, skarn, and vein-style deposits. These systems developed along several northeast-trending transpressive fault zones formed at the margins of Jurassic volcanic basins, although the world-class 171 Ma Dexing porphyry copper system was controlled by a major reactivated Neoproterozoic suture zone in the South China block. The southeast China coastal porphyry belt is parallel to the northeast-trending, temporally overlapping, 165-150 Ma tin-tungsten province, which developed in the Nanling region in a back-arc transtensional setting several hundred kilometers inboard. A new geodynamicmetallogenic model linking the two parallel belts is proposed, which is similar to that characterizing the Cenozoic metallogenic evolution of the Central Andes.

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KeyWords Plus: DEPOSITS; SUBDUCTION; MAGMATISM; YANGTZE; BLOCKS

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标题: Arsenic contamination of groundwater: A global synopsis with focus on the Indian Peninsula

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摘要: More than 2.5 billion people on the globe rely on groundwater for drinking and providing high-quality drinking water has become one of the major challenges of human society. Although groundwater is considered as safe, high concentrations of heavy metals like arsenic (As) can pose potential human health concerns and hazards. In this paper, we present an overviewof the current scenario of arsenic contamination of groundwater in various countries across the globe with an emphasis on the Indian Peninsula. With several newly affected regions reported during the last decade, a significant increase has been observed in the global scenario of arsenic contamination. It is estimated that nearly 108 countries are affected by arsenic contamination in groundwater (with concentration beyond maximum permissible limit of 10 ppb recommended by theWorld Health Organization. The highest among these are from Asia (32) and Europe (31), followed by regions like Africa (20), North America (11), South America (9) and Australia (4). More than 230 million people worldwide, which include 180 million from Asia, are at risk of arsenic poisoning. Southeast Asian countries, Bangladesh, India, Pakistan, China, Nepal, Vietnam, Burma, Thailand and Cambodia, are the most affected. In India, 20 states and 4 Union Territories have so far been affected by arsenic contamination in groundwater. An attempt to evaluate the correlation between arsenic poisoning and aquifer type shows that the groundwater extracted from unconsolidated sedimentary aquifers, particularly those which are located within the younger orogenic belts of the world, are theworst affected. More than 90% of arsenic pollution is inferred to be geogenic. We infer that alluvial sediments are the major source for arsenic contamination in groundwater andwe postulate a strong relation with plate tectonic processes, mountain building, erosion and sedimentation. Prolonged consumption of arsenic-contaminated groundwater results in severe health issues like skin, lung, kidney and bladder cancer; coronary heart disease; bronchiectasis; hyperkeratosis and arsenicosis. Since the major source of arsenic in groundwater is of geogenic origin, the extend of pollution is complexly linked with aquifer geometry and aquifer properties of a region. Therefore, remedialmeasures are to be designed based on the sourcemineral, climatological and hydrogeological scenario of the affected region. The corrective measures available include removing arsenic from groundwater using filters, exploring deeper or alternative aquifers, treatment of the aquifer itself, dilutionmethod by artificial recharge to groundwater, conjunctive use, and installation of nano-filter, among other procedures. The vastmajority of people affected by arsenic contamination in the Asian countries are the poor who live in rural areas and are not aware of the arsenic poisoning and treatment protocols. Therefore, creating awareness and providing proper medical care to these people remain as a great challenge. Very few policy actions have been taken at international level over the past decade to reduce arsenic contamination in drinking water, with the goal of preventing toxic impacts on human health. We recommend that that United Nations Environment Programme (UNEP) andWHO should take stock of the global arsenic poisoning situation and launch a global drive to create awareness among people/medical professionals/health workers/administrators on this global concern. (C) 2021 ChinaUniversity of Geosciences (Beijing) and Peking University.

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作者: Wei, D (Wei, Dan); Guo, SJ (Guo, Shangjiang)

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摘要: This paper performs an in-depth qualitative analysis of the dynamic behavior of a diffusive Lotka-Volterra type competition system with advection terms under the homogeneous Dirichlet boundary condition. First, we obtain the existence, multiplicity and explicit structure of the spatially nonhomogeneous steady-state solutions by using implicit function theorem and Lyapunov-Schmidt reduction method. Secondly, by analyzing the distribution of eigenvalues of infinitesimal generators, the stability of spatially nonhomogeneous positive steady-state solutions and the non-existence of Hopf bifurcations at spatially nonhomogeneous positive steady-state solutions are given. Finally, two concrete examples are provided to support our previous theoretical results. It should be noticed that an elliptic operator with advection term is not self-adjoint, which causes some trouble in the spatial decomposition, explicit expressions of steady-state solutions and some deductive processes related to infinitesimal generators. Moreover, unlike other work, the advection rate here depends on the spatial position, which increases some difficulties in the investigation of the principal eigenvalue.

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标题: Tracing Riverine Particulate Black Carbon Sources in Xijiang River Basin: Insight from Stable Isotopic Composition and Bayesian Mixing Model

作者: Liu, JK (Liu, Jinke); Han, GL (Han, Guilin)

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摘要: Rivers transport abundant terrestrial carbon into the ocean, constituting a fundamental channel between terrestrial carbon pools and oceanic carbon pools. The black carbon (BC) derived from biomass and fossil fuel combustion is an important component of the riverine organic carbon flux. A recent study estimated that approximately 17 -37 Tg C of BC was delivered in suspended particle phase by rivers per year. The particulate black carbon (PBC) in river systems has rarely been investigated and its controlling factors have remained largely unknown. The stable isotopic compositions of PBC in Xijiang River during the wet season are reported in this study. We found that the PBC/particulate organic carbon (POC) ratio in Xijiang River was slightly higher than that of other rivers, which may be a result of the mobility difference between POC and PBC, aerosol BC input and riverine biogenic effect. We found that the isotopic compositions of PBC depleted 13 C compared with those of POC and dissolved organic carbon (DOC). This divergence may be derived from the fractionation during soil organic matter production and biomass burning or fossil fuel combustion BC particles input with different isotopic compositions. The MixSIAR model indicated that most of the PBC in the study area was derived from fossil fuel combustion (-80%), the contribution of C4 plants burning was limited. Our result highlights that in the watershed without wildfire impact, the aeolian transport and deposition of the particles from fuel oil, coal combustion, and vehicle exhaust could significantly affect the BC flux in rivers.

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作者: Deng, J (Deng, Jun); Wang, QF (Wang, Qingfei); Gao, L (Gao, Liang); He, WY (He, Wenyan); Yang, ZY (Yang, Zhenyu); Zhang, SH (Zhang, Shihong); Chang, LJ (Chang, Lijun); Li, GJ (Li, Gongjian); Sun, X (Sun, Xiang); Zhou, DQ (Zhou, Daoqing)

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摘要: Controls on the formation and distribution of mineralization in continental collisional settings remain unclear. However, our synthesis of diverse geophysical data sets from the eastern margin of Tibet revealed that differential crustal rotation played a key role in the production of a variety of mineralization types. Due to Cenozoic continental collision between India and Eurasia, the elongated continental blocks in the eastern margin of Tibet were extruded and reoriented. Prior to block extrusion in the Eocene, two giant porphyry-skarn ore clusters formed at the boundaries between the central segment and both the northern and southern segments of the Jinshajiang-Ailaoshan suture zone. These crustal segment boundaries displayed counterclockwise rotation, due to clockwise rotation of the central segment relative to both the essentially immobile northern and southern segments, combined with crust-mantle decoupling. This is considered to have induced crustal friction and resultant generation of fertile magmas that formed the porphyry-skarn Cu-Au deposits. During Oligocene-Miocene block extrusion, differential rotation of upper crust occurred on the western and eastern sides of the north-northwest-trending Central Axis fault in the Lanping-Simao basin. Two Oligocene-Miocene Mississippi Valley?type ore clusters occur on fault segments with anomalous differential rotation of 70 degrees to 80 degrees, suggesting that this differential rotation resulted in local extension with consequent ore-fluid influx.

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作者: Long, F (Long, Fei); Zhang, CK (Zhang, Chuan-Ke); Jiang, L (Jiang, Lin); He, Y (He, Yong); Wu, M (Wu, Min)

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摘要: This paper is concerned with the delay-dependent stability analysis of linear systems with a time-varying delay. Two types of improved Lyapunov-Krasovskii functionals (LKFs) are developed to derive less conservative stability criteria. First, a new delay-product-type LKF, including single integral terms with time-varying delays as coefficients is developed, and two stability criteria with less conservatism due to more delay information included are established for different allowable delay sets. Second, the delay-product-type LKF is further improved by introducing several negative definite quadratic terms based on the idea of matrix-refined-function-based LKF, and two stability criteria with more cross-term information and less conservatism for different allowable delay sets are also obtained. Finally, a numerical example is utilized to verify the effectiveness of the proposed methods.

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作者: Shen, J (Shen, Jun); Chen, JB (Chen, Jiubin); Algeo, TJ (Algeo, Thomas J.); Feng, QL (Feng, Qinglai); Yu, JX (Yu, Jianxin); Xu, YG (Xu, Yi-Gang); Xu, GZ (Xu, Guozhen); Lei, Y (Lei, Yong); Planavsky, NJ (Planavsky, Noah J.); Xie, SC (Xie, Shucheng)

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摘要: Enhanced regional subduction-related volcanism in the South China craton concurrent with Siberian Traps large igneous province magmatism was a likely contributor to major biotic and environmental stresses associated with the Permian-Triassic boundary (ca. 252 Ma) mass extinction. However, the timing, intensity, and duration of this regional volcanic activity remain uncertain. We analyzed mercury (Hg) concentrations in three widely separated marine sections in the South China craton (Shangsi, Ganxi, and Chaohu) as well as Hg isotopic compositions in one section (Shangsi) from the Upper Permian (Changhsingian) through the lowermost Triassic (Induan) in order to track volcanic inputs. Four mercury enrichment (ME) intervals, dating to the lowermost Changhsingian (ME1), mid-Clarkina changxingensis zone (ME2), upper C. changxingensis to lower C. yini zones (ME3), and latest Permian mass extinction (LPME) interval (ME4), were recognized on the basis of elevated Hg/total organic carbon ratios. These records provide evidence of strong volcanism in the Tethyan region starting -2 m.y. before the LPME, whereas only the ME4 event is recorded in extra-Tethyan sections. Mercury isotopes support the inference that pre-LPME Hg peaks were related to regional subduction-related volcanism, and that Hg emissions at the LPME were the result of Siberian Traps large igneous province intrusions into organic-rich sediments. This study demonstrates the feasibility of distinguishing flood-basalt from subduction-related volcanic inputs on the basis of marine sedimentary Hg records.

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Forced waves and gap formations for a Lotka-Volterra competition model with nonlocal dispersal and shifting habitats

作者: Wang, JB (Wang, Jia-Bing); Wu, CF (Wu, Chufen)

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摘要: This paper is mainly concerned with the forced waves and gap formations for a Lotka-Volterra competition model with nonlocal dispersal and shifting habitats. We first show that there exist two positive numbers c(1)\* and c(2)\* such that the system admits a forced wave provided that the forcing speed c is an element of (-c(2)\*, c(1)\*) by the iterative techniques combining with some known results for the forced moving KPP equations. Meanwhile, we use some delicate analysis to obtain the asymptotic behaviors at infinity of the forced waves with nonzero forcing speed c is an element of (-c(2)\*, 0) boolean OR (0, c(1)\*). Then, based on the comparison argument, we prove that the gap formations exist for c > c(1)\* and c < -c(2)\*. Finally, some numeric simulation results are presented to confirm our theoretical results, which also contains the critical cases of c = c(1)\* and c = -c(2)\*. (C) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Lotka-Volterra competition model; Nonlocal dispersal; Forced waves; Gap formations; Shifting habitats

KeyWords Plus: FISHER-KPP EQUATION; DYNAMICS; EXTINCTION; PERSISTENCE; EVOLUTION; PATTERNS

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标题: Landslide displacement prediction using kinematics-based random forests method: A case study in Jinping Reservoir Area, China

作者: Hu, XL (Hu, Xinli); Wu, SS (Wu, Shuangshuang); Zhang, GC (Zhang, Guangcheng); Zheng, WB (Zheng, Wenbo); Liu, C (Liu, Chang); He, CC (He, Chuncan); Liu, ZX (Liu, Zhongxu); Guo, XY (Guo, Xuyuan); Zhang, H (Zhang, Han)

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摘要: Purely empirical and numerical methods are widely used in landslide movement prediction because they can forecast the failure time and consider influence factors, respectively. However, the combination of these two methods for prediction is rare. This paper develops an integrated landslide movement prediction model that can fully consider landslide kinematics and external influence factors using the Verhulst inverse function (VIF) and the random forest (RF) algorithm. The VIF is applied to describe the kinematic behavior of landslides using the rationale of three-stage creep deformation. The RF algorithm is to quantify the response of landslide displacement to the influence of external factors such as reservoir water level and rainfall intensities. The novelty of the VIF-RF model is illustrated by applying to a reservoir landslide, Gapa Landslide, in Southwestern China. The results show that the VIF-RF model shows significant improvement in predicting landslide movement compared with the VIF or RF model. The error analysis confirms that the root mean square error of the VIF-RF decreases by more than 20% compared with the VIF and RF models. In addition, the mean absolute percentage error of the VIF-RF models is less than 5%, a decrease by 2.3% and 10.1% compared to the VIF and RF models, respectively. The feasibility of the VIF-RF model for predicting movement of other reservoir landslides was successfully verified by the Majiagou landslide in the TGRA. The developed VIF-RF model indicates the Gapa landslide deformation is at the primary stage over the monitoring period. The displacement at the G1 and G2 monitoring locations of the Gapa landslide is projected to increase to 2719.8 and 2438.8 mm in January 2021, respectively, and the average rate in the accelerated deformation periods is projected to be 67.8 mm/month. The presented VIF-RF model provides an effective approach for predicting the long-term landslide deformation and identifying its deformation stage.

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语言: English

文献类型: Article

作者关键词: Landslides; Prediction; Displacement; Kinematics; Random forests; Verhulst inverse function

KeyWords Plus: 3 GORGES RESERVOIR; TIME; FAILURE; MODEL; MACHINE; RIVER

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标题: Evolution characteristics and displacement forecasting model of landslides with stair-step sliding surface along the Xiangxi River, three Gorges Reservoir region, China

作者: Li, CD (Li, Changdong); Criss, RE (Criss, Robert E.); Fu, ZY (Fu, Zhiyong); Long, JJ (Long, Jingjing); Tan, QW (Tan, Qinwen)

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摘要: Five large and many small landslides are developed in Jurassic strata along the lower reaches of Xiangxi River, where interbedded weak and hard bedrock layers foster the development of landslides with a "stair-step" sliding surface. The paper investigates the evolution characteristics of these landslides and presents a novel forecasting model for their displacements. The distribution characteristics and behavior of landslides developed along Xiangxi River is revealed by the database of landslides in the larger Zigui basin, of which this area is part. Most landslides occur at rather low elevations of <300 m and in areas of moderate rainfall. The geological evolution of landslides in the Xiangxi River valley can be divided into four stages, beginning with anticline formation, followed by valley incision, then by weathering and erosion, and culminating in formation of the colluvial landslides. The accumulative displacement curves of landslides with a stair-step sliding surface in Xiangxi River region also present obvious, step-like characteristics. A novel GA-CEEMD-RF algorithm was developed to predict the displacement of these stair-step landslides, which helps to define the combination of induced factors and weak stableness of prediction results using a single displacement prediction model and the multi-field monitoring data.

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标题: Facile synthesis of gold-silver/copper sulfide nanoparticles for the selective/sensitive detection of chromium, photochemical and bactericidal application

作者: Yang, YF (Yang, Yafeng); Ashraf, MA (Ashraf, Muhammad Aqeel); Fakhri, A (Fakhri, Ali); Gupta, VK (Gupta, Vinod Kumar); Zhang, DQ (Zhang, Dangquan)

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摘要: In this project, bimetallic Au-Ag nanoparticles/CuS nanoparticles were prepared via simple hydrothermal methods, which were used as highly efficient material for Cr (III) detection, photocatalytic, and biological process. The Au-Ag/CuS nanoparticles was studied via UV-visible spectroscopy, field-emission scanning electron microscopy, Dynamic light scattering, and X-ray diffraction. The zeta potential and effective size of Au-Ag/CuS nanoparticles was -32.1 mV and 25 nm respectively. The response time of Cr (III) ions interaction was 2 min. The lowest detection of Cr (III) by Au-Ag/CuS nanoparticles was 0.5 nM. The Au-Ag/CuS nano catalyst was applied to decomposition of drug under visible lamp irradiation. The photo degradation response of drug was 100.0% in 30 min irradiation. The particles exhibited excellent antibacterial activities. (C) 2020 Elsevier B.V. All rights reserved.

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作者关键词: Bimetallic Au-Ag; CuS; Colorimetric detection; Photocatalysis; Bactericidal

KeyWords Plus: COLORIMETRIC DETECTION; PHENOLIC-ACIDS; CHITOSAN; PHOTOCATALYSIS; NANOCOMPOSITES; CHROMATOGRAPHY; FLAVONOIDS

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标题: Drought effects on soil carbon and nitrogen dynamics in global natural ecosystems

作者: Deng, L (Deng, Lei); Peng, CH (Peng, Changhui); Kim, DG (Kim, Dong-Gill); Li, JW (Li, Jiwei); Liu, YL (Liu, Yulin); Hai, XY (Hai, Xuying); Liu, QY (Liu, Qiuyu); Huang, CB (Huang, Chunbo); Shangguan, ZP (Shangguan, Zhouping); Kuzyakov, Y (Kuzyakov, Yakov)

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摘要: Extreme droughts have serious impacts on the pools, fluxes and processes of terrestrial carbon (C) and nitrogen (N) cycles. A deep understanding is necessary to explore the impacts of this extreme climate change events. To investigate how soil C and N pools and fluxes respond to drought and explore their mechanisms we conducted a meta-analysis synthesizing the responses of soil C and N cycles to droughts (precipitation reduction experiments) in three main natural ecosystems: forests, shrubs and grasslands. Data were collected from 148 recent publications (1815 sampling data at 134 sites) with the drought experiments from 1 to 13 years across the globe. Drought reduced soil organic C content (-3.3%) mainly because of decreased plant litter input (-8.7%) and reduced litter decomposition (-13.0%) across all the three ecosystem types in the world. Drought increased mineral N content (+31%) but reduced N mineralization rate (-5.7%) and nitrification rate (-13.8%), and thus left total N unchanged. Compared with the local precipitation, drought increased the accumulation of dissolved organic C and N contents by +59% and +33%, respectively, due to retarded mineralization and higher stability of dissolved organic matter. Among the three ecosystem types, forest soils strongly increased litter C (+64%, n=8) and N content (+33%, n=6) as well as microbial CO2 (+16%, n=55), whereas total CO2 emission remains unaffected. Drought decreased soil CO2 emission (-15%, n=53) in shrubs due to reduction of microbial respiration and decreased root biomass. The 98% (n=39) increase of NH4+ concentration in forest soils corresponds to 11% (n=37) decrease of NO3- and so, it reflected the increase of N mineralization rate, but the decrease of nitrification. For shrubs and grasslands, however, stabilized or decreased N mineralization and nitrification mean less N uptake by plants under drought. Overall, the effects of drought on soil C and N cycles were regulated by the ecosystem type, drought duration and intensity. The drought intensity and duration intensify all effects, especially on the decreasing total (CO2) emission. However, the most studies mainly focused on the short-term droughts, and there is a lack of comprehensive understanding of how drought effects in a long-term consequences. So, future studies should strengthen drought frequency impacts on ecosystem C and N dynamics in the long-term sequence (> 10 years) in order to face the impacts of global change.

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作者关键词: mineral N; N mineralization; nitrification; precipitation reduction; plant C input; soil microorganisms; soil organic C; soil CO2 emission

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标题: One-step chromatographic purification of K, Ca, and Sr from geological samples for high precision stable and radiogenic isotope analysis by MC-ICP-MS

作者: Li, XQ (Li, Xiaoqiang); Han, GL (Han, Guilin)

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摘要: Multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) is widely used in stable and radiogenic isotope analysis of various elements because of the extremely high precision and accuracy. At present, stable K, Ca, and radiogenic Sr isotopes are increasingly used as a combined proxy of geological processes. However, time consuming and cumbersome multi-step chemical procedures hinder their development and application. This study presents a method for one-step chromatographic separation of K-Ca-Sr from matrix elements, and the purification procedure is based on AG50W-X12 cation exchange resin without any intervening evaporation step. The K fraction was first collected using 10 mL 2 M (mol L-1) HCl, the Ca fraction was then collected using 18 mL 2 M HCl, and the Sr fraction was collected at last using 10 mL 3 M HCl. K-Ca-Sr isotopic ratios were measured by using MC-ICP-MS (Nu Plasma 3) with a sample-standard bracketing (SSB) method. The stability of our chemical procedure was demonstrated by replicate measurements of ten international reference materials of rocks and seawater. The analytical results obtained for these reference materials are consistent with previously reported values within analytical errors. The external reproducibility of a BCR-2 standard sample was +/- 0.05 parts per thousand (2SD, N = 9) for delta K-41/39, +/- 0.04 parts per thousand (2SD, N = 9) for delta Ca-44/42, and 0.000012 (2SD, N = 4) for Sr-87/Sr-86. Thus, this optimal separation method improves the experimental efficiency and reduces cross-contamination.

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标题: Spontaneous imbibition in tight porous media with different wettability: Pore-scale simulation

作者: Lin, W (Lin, Wei); Xiong, SC (Xiong, Shengchun); Liu, Y (Liu, Yang); He, Y (He, Ying); Chu, SS (Chu, Shasha); Liu, SY (Liu, Siyu)

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摘要: Spontaneous imbibition is significantly influenced by rock wettability, and it has been extensively studied in core-based experiments and numerical simulations owing to its important role in the development of oil/gas reservoir. Due to the fine pore structure and complex wettability of tight sandstone, an in-depth exploration of the effects of wettability on the pore-scale flow physics during spontaneous imbibition is of great value to complement traditional experimental studies and enhance the understanding of microscopic flow mechanisms during the development of tight oil reservoirs. Based on a X-ray computed tomography scanning experiment and a lattice Boltzmann multiphase model, in this work, we systematically investigate the effects of different hydrophilic strengths on the evolution of the imbibition fronts within the micropores and the degree of nonwetting fluid recovery during spontaneous imbibition of tight sandstone. The results show that the wettability significantly affects the morphological characteristics of the imbibition fronts. Under strong hydrophilic conditions, the wetting fluid preferentially invades the pore corner in the form of angular flow. As the contact angle increases, the hysteresis effect at the main terminal interface decreases, and the two-phase interface becomes regular and compact. Wettability also significantly affects the imbibition rate and the nonwetting fluid recovery degree. The smaller the contact angle, the faster the imbibition rate and the higher the recovery degree of nonwetting fluids during the cocurrent spontaneous imbibition. Published under license by AIP Publishing.

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摘要: The Ar-40/Ar-39 dating method is among the most versatile of geochronometers, having the potential to date a broad variety of K-bearing materials spanning from the time of Earth's formation into the historical realm. Measurements using modern noble-gas mass spectrometers are now producing Ar-40/Ar-39 dates with analytical uncertainties of similar to 0.1%, thereby providing precise time constraints for a wide range of geologic and extraterrestrial processes. Analyses of increasingly smaller subsamples have revealed age dispersion in many materials, including some minerals used as neutron fluence monitors. Accordingly, interpretive strategies are evolving to address observed dispersion in dates from a single sample. Moreover, inferring a geologically meaningful "age" from a measured "date" or set of dates is dependent on the geological problem being addressed and the salient assumptions associated with each set of data. We highlight requirements for collateral information that will better constrain the interpretation of Ar-40/Ar-39 data sets, including those associated with single-crystal fusion analyses, incremental heating experiments, and in situ analyses of microsampled domains. To ensure the utility and viability of published results, we emphasize previous recommendations for reporting Ar-40/Ar-39 data and the related essential metadata, with the amendment that data conform to evolving standards of being findable, accessible, interoperable, and reusable (FAIR) by both humans and computers. Our examples provide guidance for the presentation and interpretation of Ar-40/Ar-39 dates to maximize their interdisciplinary usage, reproducibility, and longevity.

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作者: Wu, M (Wu, Min); Su, WJ (Su, Wanjuan); Chen, LF (Chen, Luefeng); Liu, ZT (Liu, Zhentao); Cao, WH (Cao, Weihua); Hirota, KR (Hirota, Kaoru)

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摘要: The weight-adapted convolution neural network (WACNN) is proposed to extract discriminative expression representations for recognizing facial expression. It aims to make good use of the convolution neural network's (CNN's) potential performance in avoiding local optima and speeding up convergence by the hybrid genetic algorithm (HGA) with optimal initial population, in such a way that it realizes deep and global emotion understanding in human-robot interaction. Moreover, the idea of novelty search is introduced to solve the deception problem in the HGA, which can expend the search space to help genetic algorithm jump out of local optimum and optimize large-scale parameters. In the proposal, the facial expression image preprocessing is conducted first, then the low-level expression features are extracted by using a principal component analysis. Finally, the high-level expression semantic features are extracted and recognized by WACNN which is optimized by HGA. In order to evaluate the effectiveness of WACNN, experiments on JAFFE, CK+, and static facial expressions in the wild 2.0 databases are carried out by using k-fold cross validation, and experimental results show the recognition accuracies of the proposal are superior to that of the state-of-the-art, such as local directional ternary pattern and weighted mixture deep neural network (DNN), which aim to extract discriminative and are the DNN-based methods. Moreover, recognition accuracies of the proposal are also higher than the deep CNN without HGA, which indicates that the proposal has better global optimization ability. Meanwhile, preliminary application experiments are also carried out by using the proposed algorithm on the emotional social robot system, where nine volunteers and two-wheeled robots experience the scenario of emotion understanding. Application results indicate that the wheeled robots can recognize basic expressions, such as happy, surprise, and so on.

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作者: Yu, B (Yu, Bing); Santosh, M (Santosh, M.); Amaldev, T (Amaldev, T.); Palin, RM (Palin, Richard M.)

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摘要: Early continent-building processes on Earth are challenging to investigate, particularly since juvenile felsic crust formed during the Early Archean (4.0-3.2 Ga) is rarely preserved. Thus, associated sedimentary records are of fundamental importance, although in many cases these have been metamorphosed and reworked to various degrees since deposition. Here we present new petrological and zircon and monazite U-Pb age data from one of the Earth's oldest 'khondalite' (granulite-facies aluminous metapelite) belt, which we define as the Mercara khondalite belt, and associated charnockite and mafic granulite from the Mercara suture, the collision zone welding the Coorg and Western Dharwar Blocks in southern India. Petrologic analyses and phase equilibria modelling of the khondalites and associated charnockite and mafic granulite reveal a clockwise pressure-temperature (P-T) path with a peak temperature of above ca. 900 "C, and pressures up to 12 kbar. Detrital zircon grains in the metasedimentary rocks have magmatic cores with oscillatory zoning and ages up to ca. 3.5 Ga, and metamorphic overgrowths with ages of 3.1-3.0 Ga. Monazite in the khondalites yield identical metamorphic ages in the range of 3.1 to 3.0 Ga. Some of these rocks are overprinted by a younger thermal event at ca. 2.8-2.6 Ga. We correlate the high P-T metamorphism with the subduction-collision history between the northern margin of the Mercara block and the Western Dharwar Craton during the Mesoarchean, which indicates that plate tectonics had been established on Earth by at least ca. 3.1 Ga, in agreement with many independent lines of evidence. The Mesoarchean Mercara khondalite belt signals emergence of continents on the early Earth with active drainage systems leading to the deposition of voluminous detritus. The ca. 3.1 to 3.0 Ga (ultra) high temperature and high pressure metamorphism also coincides with the timing of assembly of the Earth's oldest supercontinent Ur (C) 2020 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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摘要: The pandemic of COVID-19 witnessed a massive infodemic with the public being bombarded with vast quantities of information. The spreading of neutral and highly accurate reports can guide the public to self-protect and reduce the pandemic. Mis- and dis-information would intrigue panic and high exposure risk to epidemic. Although the infodemic has attracted attentions from the academia, it is still not known to what degree and in which direction the information flows contribute to the COVID-19 pandemic. To fill the gap, we apply network reconstruction techniques to rebuild the hidden multiplex network of information and COVID-19 spreading by which we aim at quantifying the interaction between the propagation of information and the spatial outbreak of COVID-19, and delineate between the positive and negative impact of information on the pandemic. By differentiating the types of media that participated in the information process, we find that in the early stage of COVID-19 pandemic, infodemic does play a critical role to amplify the risk of virus outbreak in China and the risk is even larger for those highly developed regions. Compared to the old-fashion media, the new mobile platforms impose a greater risk to reinforce the positive feedback between infodemic and COVID-19 pandemic.

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作者关键词: Infodemic; COVID-19; multiplex network; spatial social network

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标题: Self-Guiding Polymeric Prodrug Micelles with Two Aggregation-Induced Emission Photosensitizers for Enhanced Chemo-Photodynamic Therapy

作者: Yi, XQ (Yi, Xiaoqing); Hu, JJ (Hu, Jing-Jing); Dai, J (Dai, Jun); Lou, XD (Lou, Xiaoding); Zhao, ZJ (Zhao, Zujin); Xia, F (Xia, Fan); Tang, B (Tang, Ben Zhong)

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摘要: Nowadays, aggregation-induced emission luminogens (AIEgens) with reactive oxygen species (ROS) generating ability have been used as photosensitizers for imaging guided photodynamic therapy (PDT). To achieve enhanced antitumor outcomes, combining AIEgens-based PDT with chemotherapy is an efficient strategy. However, the therapeutic efficiency is hampered by the limited cellular uptake efficiency and the appropriate light irradiation occasion. In this paper, a self-guiding polymeric micelle (TB@PMPT) composed of two AIE photosensitizers and a reduction-sensitive paclitaxel prodrug (PTX-SS-N-3) was established for enhanced chemo-photodynamic therapy by a dual-stage light irradiation strategy. When the micelles were accumulated in tumor tissues, the first light irradiation (L-1, 6 min) was utilized to facilitate cellular uptake by "photochemical internalization" (PCI). Then, the intracellular glutathione (GSH) would induce the PTX release, micelles disassembly and the aggregation state change of AIEgens. The fluorescence signal change of two AIEgens-based ratiometric fluorescent probe could not only precisely guide the second light irradiation (L-2, 18 min) for sufficient ROS production, but also monitor the nonfluorescent drug PTX release in turn. Both in vivo and in vitro studies demonstrated that the dual-stage light irradiation strategy employed for TB@PMPT micelles exhibited a superior therapeutic effect over only 24 min continuous light irradiation.

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作者关键词: AIEgen-based photosensitizer; dual-stage light irradiation strategy; ratiometric fluorescent probe; improved cellular uptake; combined chemo-photodynamic therapy

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标题: Pyrolysis kinetics and reaction mechanism of expandable polystyrene by multiple kinetics methods

作者: Zhang, WL (Zhang, Wenlong); Zhang, J (Zhang, Juan); Ding, YM (Ding, Yanming); He, QZ (He, Qize); Lu, KH (Lu, Kaihua); Chen, HY (Chen, Haiyan)

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摘要: Expandable polystyrene (EPS), as an industrial material extensively used for energy saving in building exterior insulation system, helps to decrease the energy consumption from buildings. However, such material, because of its flammability, still has the potential risk of resulting in a large number of fire accidents. Pyrolysis is deemed as an essential stage before combustion, so studies on pyrolysis can lay a solid foundation for understanding the thermal behavior of EPS before combustion. Nevertheless, with a growing number of undegradable EPS waste that results in environmental issues, some measures must be taken to dispose of such waste. In this case, pyrolysis technology is gradually employed to convert polymer wastes into fuel or chemical feedstock. Therefore, it is necessary to investigate the pyrolysis of EPS. To obtain the pyrolysis kinetics and mechanism of EPS, thermogravimetric analysis was performed at wider heating rates in the air, and the activation energy was estimated by adopting commonly-used model-free methods (including Flynn-Wall-Ozawa, Kissinger-Akahira-Sunose, Senum-Yang, Starink, and Advanced Vyazovkin method). Then, a reaction mechanism was established and the kinetic parameters were calculated by Coats-Redfern and masterplots methods. Finally, the Malek method was applied for a reconstruction of the experimental kinetic model of EPS pyrolysis. Results indicated that the pyrolysis of EPS might be well characterized by employing a reconstructed reaction function d alpha/dt = 2.18 x 10(8)exp(-1.38 x 10(5)/RT)alpha(0.0309)(1-alpha)(0.7689). Furthermore, the results of pyrolysis analysis, especially the reaction function of such a reaction mechanism, could provide guidance for large-scale fire simulation of EPS and disposal of EPS waste, thus contributing to environmental sustainability and cleaner production of fuel. (C) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Expandable polystyrene; Pyrolysis; Kinetic parameters; Model reconstruction; Reaction mechanism

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作者: Min, X (Min, Xin); Xiao, J (Xiao, Jun); Fang, MH (Fang, Minghao); Wang, W (Wang, Wei (Alex)); Zhao, YJ (Zhao, Yajing); Liu, YG (Liu, Yangai); Abdelkader, AM (Abdelkader, Amr M.); Xi, K (Xi, Kai); Kumar, RV (Kumar, R. Vasant); Huang, ZH (Huang, Zhaohui)

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摘要: The limited resources and uneven distribution of lithium stimulate strong motivation to develop new rechargeable batteries that use alternative charge carriers. Potassium-ion batteries (PIBs) are at the top of the list of alternatives because of the abundant raw materials and relatively high energy density, fast ion transport kinetics in the electrolyte, and low cost. However, several challenges still hinder the development of PIBs, such as low reversible capacity, poor rate performance, and inferior cycling stability. Research on the cathode is currently focused on developing materials with high energy density and cycling stability, mainly including layered transition metal oxides, polyanion compounds, organic compounds, etc. Anodes based on intercalation reactions, conversion reactions, and alloying with potassium are currently under development, and promising results have been published. This review comprehensively summarizes the research effort to date on the electrode material optimization (e.g., crystals, morphology, reaction mechanisms, and interface control), the synthesis methods, and the full cell fabrication for PIBs to enhance the electrochemical potassium storage and provide a platform for further development in this battery system.

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标题: Strain-induced semiconductor to metal transition in MA(2)Z(4) bilayers (M = Ti, Cr, Mo; A = Si; Z = N, P)

作者: Zhong, HX (Zhong, Hongxia); Xiong, WQ (Xiong, Wenqi); Lv, PF (Lv, Pengfei); Yu, J (Yu, Jin); Yuan, SJ (Yuan, Shengjun)

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摘要: Very recently, a new type of two-dimensional layered material, MoSi2N4, was fabricated that is semiconducting with weak interlayer interaction, high strength, and excellent stability. We systematically investigate the effect of vertical strain on the electronic structure of MA(2)Z(4) (M = Ti/Cr/Mo, A = Si, Z = N/P) bilayers. Taking bilayer MoSi2N4 as an example, our first-principles calculations show that its indirect band gap decreases monotonically as the vertical compressive strain increases. Under a critical strain around 22%, it undergoes a transition from semiconductor to metal. We attribute this to the opposite energy shift of states in different layers, which originates from the built-in electric field induced by the asymmetric charge transfer between two inner sublayers near the interface. Similar semiconductor to metal transitions are observed in other strained MA(2)Z(4) bilayers, and the estimated critical pressures to realize such transitions are within the same order as semiconducting transition metal dichalcogenides. The semiconductor to metal transitions in the family of MA(2)Z(4) bilayers present interesting possibilities for strain-induced engineering of their electronic properties.

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标题: Whole process analysis of geothermal exploitation and power generation from a depleted high-temperature gas reservoir by recycling CO2

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摘要: The geothermal resource in depleted high-temperature gas fields is abundant, and CO2 is more suitable to exploit geothermal energy from these gas fields due to its high mobility and thermal physical properties. However, all the related mechanisms, operation processes, and economic analyses have not been comprehensively analyzed yet. To assess the technical and economic feasibility of this method of geothermal exploitation, a 120 degrees C depleted gas reservoir was selected to build geological and numerical models for analyzing its gas composition, temperature, and pressure during the whole process, including enhanced gas recovery, pressure build-up, and pure geothermal exploitation, based on existing wells. The results reveal that the CO2 injection during EGR and pressure build-up can affect the reservoir temperature, and the optimization analyses indicate the heat mining rate can be maintained about 10 MWth for 30 years. The thermodynamic cycle analyses show that a power of 132.7 kW can be obtained if the organic Rankine cycle system with R134a is adopted, and the cost of geothermal power generation is about 0.45 $/(kW.h) when the CO2 price is 12 $/t. However, if the produced CO2 directly drives the turbine, the power can increase to 718.5 kW and the cost reduces to 0.1$/(kW.h). (C) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Depleted high-temperature gas reservoir; Geothermal exploitation; Carbonate dioxide; Comprehensive process analysis; Organic Rankine cycle; CO2 direct cycle

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标题: Probabilistic analysis of a discrete element modelling of the runout behavior of the Jiweishan landslide

作者: Li, B (Li, Bing); Gong, WP (Gong, Wenping); Tang, HM (Tang, Huiming); Zou, ZX (Zou, Zongxing); Bowa, VM (Bowa, Victor Mwango); Juang, CH (Juang, C. Hsein)

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摘要: Landslide is one of the most destructive geohazards around the world. The destruction of a landslide can be estimated from its deformation and runout behaviors, which might be simulated with numerical software such as particle flow code (PFC). In the PFC simulation of the runout behavior of a landslide, the results are dependent upon the particle-particle contact micro-parameters (e.g., contact modulus and friction coefficient). The calibration of the micro-parameters of the PFC models is a challenge and various uncertainties are involved. The uncertainty in the selection of the modelling parameters leads to uncertainty in the simulated runout behavior of the landslide. As a result, the damage potential of the landslide cannot be accurately evaluated. To this end, this paper presents a probabilistic analysis of the runout behavior of the Jiweishan landslide, in which the uncertainty in the selection of the particle-particle contact micro-parameters is explicitly considered. Here, the input micro-parameters are modeled as discrete random variables, the possible realizations of which are obtained through an orthogonal analysis of the PFC simulation-based uniaxial compression tests. The derived possible realizations of the micro-parameters are then adopted as the inputs to the built model of the landslide. With the results obtained from these PFC simulations, the runout behaviors of the Jiweishan landslide, such as the runout distance and the deposit thickness, are studied probabilistically. The results provide an improved estimate of the landslide runout behavior and further aid in making an informed risk assessment of the landslide.

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标题: Lucas-Washburn Equation-Based Modeling of Capillary-Driven Flow in Porous Systems

作者: Cai, JC (Cai, Jianchao); Jin, TX (Jin, Tingxu); Kou, JS (Kou, Jisheng); Zou, SM (Zou, Shuangmei); Xiao, JF (Xiao, Junfeng); Meng, QB (Meng, Qingbang)

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摘要: Fluid flow in porous systems driven by capillary pressure is one of the most ubiquitous phenomena in nature and industry, including petroleum and hydraulic engineering as well as material and life sciences. The classical Lucas-Washburn (LW) equation and its modified forms were developed and have been applied extensively to elucidate the fundamental mechanisms underlying the basic statics and dynamics of the capillary-driven flow in porous systems. The LW equation assumes that fluids are incompressible Newton ones and that capillary channels all have the same radii. This kind of hypothesis is not true for many natural situations, however, where porous systems comprise complicated pore and capillary channel structures at microscales. The LW equation therefore often leads to inaccurate capillary imbibition predictions in such situations. Numerous studies have been conducted in recent years to develop and assess the modifications and extensions of the LW equation in various porous systems. Significant progresses in computational techniques have also been attained to further improve our understanding of imbibition dynamics. A state-of-the-art review is therefore needed to summarize the recent significant models and numerical simulation techniques as well as to discuss key ongoing research topics arising from various new engineering practices. The theoretical basis of the LW equation is first introduced in this review and recent progress in mathematical models is then summarized to demonstrate the modifications and extensions of this equation to various microchannels and porous media. These include capillary tubes with nonuniform and noncircular cross sections, discrete fractures, and capillary tubes that are not straight as well as heterogeneous porous media. Numerical studies on the LW equation are also reviewed, and comments on future works and research directions for LW-based capillary-driven flows in porous systems are listed.

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标题: Novel Pathway for Vanadium(V) Bio-Detoxification by Gram-Positive Lactococcus raffinolactis

作者: Zhang, BG (Zhang, Baogang); Li, YN (Li, Yi'na); Fei, YM (Fei, Yangmei); Cheng, YT (Cheng, Yutong)

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摘要: Whereas prospects of bioremediation for a vanadium(V) [V(V)]-contaminated environment are widely recognized, reported functional species are extremely limited, with the vast majority of Gram-negative bacteria in Proteobacteria. Herein, the effectiveness of V(V) reduction is proved for the first time by Lactococcus raffinolactis, a Gram-positive bacterium in Firmicutes. The V(V) removal efficiency was 86.5 +/- 2.17% during 10-d operation, with an average removal rate of 4.32 +/- 0.28 mg/L.d in a citrate-fed system correspondingly. V(V) was bio-reduced to insoluble vanadium(IV) and distributed both inside and outside the cells. Nitrite reductase encoded by gene nirS mainly catalyzed intracellular V(V) reduction, revealing a previously unrecognized pathway. Oxidative stress induced by reactive oxygen species from dissimilatory V(V) reduction was alleviated through strengthened superoxide dismutase and catalase activities. Extracellular polymeric substances with chemically reactive hydroxyl (-OH) and carboxyl (-COO-) groups also contributed to V(V) binding and reduction as well as ROS scavenging. This study can improve the understanding of Gram-positive bacteria for V(V) bio-detoxification and offer microbial resources for bioremediation of a V(V)-polluted environment.

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标题: Fabrication of silver phosphate-ilmenite nanocomposites supported on glycol chitosan for visible light-driven degradation, and antimicrobial activities

作者: Ashraf, MA (Ashraf, Muhammad Aqeel); Li, C (Li, Cheng); Zhang, DQ (Zhang, Dangquan); Zhao, LF (Zhao, Linfeng); Fakhri, A (Fakhri, Ali)

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摘要: Recently, photo-degradation process under ultraviolet-light irradiation is being used as a substantial treatment method for the removal of environmental pollution. In this study, a silver phosphate-ilmenite (Ag3PO4-FeTiO3) hetero structure supported on glycol chitosan catalyst was completely prepared, also, and its structural, and optical properties were characterized. Meantime, scanning electron microscopy, X-ray diffraction, X-ray photoelectron, and UV-vis spectra were applied. The Ag3PO4-FeTiO3/glycol chitosan catalyst was used to degrade metronidazole under visible-light irradiation. The degradation rate of metronidazole in 25 min by Ag3PO4-FeTiO3/glycol chitosan nanocomposites was found to be 99.2% under UV light irradiation, which was higher than that by Ag3PO4-FeTiO3 (72.24%) and FeTiO3 (35.5%), respectively. The active species trapping test of Ag3PO4-FeTiO3/glycol chitosan indicated that center dot OH and center dot O-2(-) participated during the reaction. The diffusion method was evaluated to appraise the bactericidal activity of the synthesized nanomaterials when tested against both Staphylococcus aureus and Escherichia coli bacteria, with or without LED-light irradiation. The antibacterial tests show higher inhibition zones under light illumination as compared to dark conditions. The antifungal properties of the prepared nanomaterials were analyzed by fungi (Aspergillus niger, and Fusarium solani) using disc diffusion analysis. It was confirmed that the prepared nanomaterials have the best antifungal agent as compared to the standard antibiotics. When the Ag3PO4-FeTiO3/glycol chitosan was used, the amount of inhibition zone was enhanced. (C) 2020 Elsevier B.V. All rights reserved.

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KeyWords Plus: PHOTOCATALYTIC ACTIVITY; ANTIBACTERIAL; NANOPARTICLES; AG3PO4; WATER; REMEDIATION; NANOSHEETS; COMPOSITE; POLLUTION; REMOVAL

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标题: Incremental Factorization of Big Time Series Data with Blind Factor Approximation

作者: Chen, D (Chen, Dan); Tang, YB (Tang, Yunbo); Zhang, H (Zhang, Hao); Wang, LZ (Wang, Lizhe); Li, XL (Li, Xiaoli)

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摘要: Extracting the latent factors of big time series data is an important means to examine the dynamic complex systems under observation. These low-dimensional and "small" representations reveal the key insights to the overall mechanisms, which can otherwise be obscured by the notoriously high dimensionality and scale of big data as well as the enormously complicated interdependencies amongst data elements. However, grand challenges still remain: (1) to incrementally derive the multi-mode factors of the augmenting big data and (2) to achieve this goal under the circumstance of insufficient a priori knowledge. This study develops an incrementally parallel factorization solution (namely I-PARAFAC) for huge augmenting tensors (multi-way arrays) consisting of three phases over a cutting-edge GPU cluster: in the "giant-step" phase, a variational Bayesian inference (VBI) model estimates the distribution of the close neighborhood of each factor in a high confidence level without the need for a priori knowledge of the tensor or problem domain; in the "baby-step" phase, a massively parallel Fast-HALS algorithm (namely G-HALS) has been developed to derive the accurate subfactors of each subtensor on the basis of the initial factors; in the final fusion phase, I-PARAFAC fuses the known factors of the original tensor and those accurate subfactors of the "increment" to achieve the final full factors. Experimental results indicate that: (1) the VBI model enables a blind factor approximation, where the distribution of the close neighborhood of each final factor can be quickly derived (10 iterations for the test case). As a result, the model of a low time complexity significantly accelerates the derivation of the final accurate factors and lowers the risks of errors; (2) I-PARAFAC significantly outperforms even the latest high performance counterpart when handling augmenting tensors, e.g., the increased overhead is only proportional to the increment while the latter has to repeatedly factorize the whole tensor, and the overhead in fusing subfactors is always minimal; (3) I-PARAFAC can factorize a huge tensor (volume up to 500 TB over 50 nodes) as a whole with the capability several magnitudes higher than conventional methods, and the runtime is in the order of $\frac{1}{n}$1n to the number of compute nodes; (4) I-PARAFAC supports correct factorization-based analysis of a real 4-order EEG dataset captured from a variety of epilepsy patients. Overall, it should also be noted that counterpart methods have to derive the whole tensor from the scratch if the tensor is augmented in any dimension; as a contrast, the I-PARAFAC framework only needs to incrementally compute the full factors of the huge augmented tensor.

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标题: Thermally stable and highly efficient red-emitting Eu3+-doped Cs3GdGe3O9 phosphors for WLEDs: non-concentration quenching and negative thermal expansion

作者: Dang, PP (Dang, Peipei); Li, GG (Li, Guogang); Yun, XH (Yun, Xiaohan); Zhang, QQ (Zhang, Qianqian); Liu, DJ (Liu, Dongjie); Lian, HZ (Lian, Hongzhou); Shang, MM (Shang, Mengmeng); Lin, J (Lin, Jun)

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摘要: Red phosphor materials play a key role in improving the lighting and backlit display quality of phosphor-converted white light-emitting diodes (pc-WLEDs). However, the development of a red phosphor with simultaneous high efficiency, excellent thermal stability and high colour purity is still a challenge. In this work, unique non-concentration quenching in solid-solution Cs3Gd1 - xGe3O9:xEu(3+) (CGGO:xEu(3+)) (x = 0.1-1.0) phosphors is successfully developed to achieve a highly efficient red-emitting Cs3EuGe3O9 (CEGO) phosphor. Under the optimal 464 nm blue light excitation, CEGO shows a strong red emission at 611 nm with a high colour purity of 95.07% and a high internal quantum efficiency of 94%. Impressively, this red-emitting CEGO phosphor exhibits a better thermal stability at higher temperatures (175-250 degrees C, >90%) than typical red K2SiF6:Mn4+ and Y2O3:Eu3+ phosphors, and has a remarkable volumetric negative thermal expansion (coefficient of thermal expansion, alpha = -5.06 x 10(-5)/degrees C, 25-250 degrees C). By employing this red CEGO phosphor, a fabricated pc-WLED emits warm white light with colour coordinates (0.364, 0.383), a high colour rendering index (CRI = 89.7), and a low colour coordinate temperature (CCT = 4508 K). These results indicate that this highly efficient red-emitting phosphor has great potential as a red component for pc-WLEDs, opening a new perspective for developing new phosphor materials.

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标题: Global dynamics and spatio-temporal patterns in a two-species chemotaxis system with two chemicals

作者: Gao, JP (Gao, Jianping); Guo, SJ (Guo, Shangjiang)

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摘要: In this paper, we consider the signal-dependent diffusion and sensitivity in a chemotaxis-competition population system with two different signals in a two-dimensional bounded domain. We consider more general signal production functions and assume that the signal-dependent diffusion is a decreasing function which may be degenerate with respect to the density of the corresponding signal. We first obtain the global existence and uniform-in-time bound of classical solutions and show that the blow-up effect can be precluded for signal-dependent diffusion and sensitivity with certain properties. Then, by constructing Lyapunov functionals, we study the global attractivity of nonzero (boundary/positive) homogeneous steady states under three different strengths of competition. In particular, we obtain that the nonzero boundary constant steady states are globally asymptotically stable when they are globally attractive, which means no pattern formation occurs, while for interior constant steady state, its global attractivity can imply the global stability for some special signal production functions. Finally, numerical simulations show that for large signal sensitivity, different signal production functions can lead to various complex spatial-temporal patterns around the positive homogeneous steady state. In particular, for a given signal production mechanism, various patterns are observed for different population growth rates.

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作者关键词: Chemotaxis; Signal-dependent; Competition model; Global existence; Lyapunov functional; Spatial-temporal patterns

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标题: A newly discovered function of nitrate reductase in chemoautotrophic vanadate transformation by natural mackinawite in aquifer

作者: He, C (He, Chao); Zhang, BG (Zhang, Baogang); Lu, JP (Lu, Jianping); Qiu, R (Qiu, Rui)

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摘要: Mackinawite (FeS), a widely-distributed natural reducing mineral, can donate electron for various (bio)processes. However, little is known about mackinawite-driven chemoautotrophic bioreduction of toxic vanadate [V(V)] in aquifer. This study demonstrates that V(V) is successfully bioreduced by mackinawite under anaerobic condition via 150-d operation of constructed aquifer. Complete V(V) removal was achieved at the initial concentration of 10 mg/L and flow rate of 0.125 mL/min. Fluctuant hydrochemistry and hydrodynamics affected V(V) removal performance. Biotic activity was identified as the major contribution to V(V) transformation (76.4 +/- 1.01%). Chemoautotrophic genera (e.g., Thiobacillus) could oxidize FeS coupled to direct V(V) reduction independently. Heterotrophic V(V) reducers (e.g., Pseudomonas and Spirochaeta) could also achieve V(V) detoxification by utilizing metabolic intermediates synthesized by autotrophic Fe(II) oxidizers (e.g., Thiobacillus) and S(-II) oxidizing genera (e.g., Sulfuricurvum). Gene abundance and enzymatic activity tests confirmed that nitrate reductase gene napA functioned crucially in chemoautotrophic V(V) reduction by Fe(II) and S(-II) donating electron. V(V) was reduced to insoluble V(IV) while elements in mackinawite were oxidized to Fe(III) and SO42-. This study reveals the coupling of iron, sulfur and vanadium in biogeochemical cycling, and offers a promising strategy for remediation of V(V)-polluted aquifer. (C) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Chemoautotrophic bioprocess; Vanadate; Bioreduction; Mackinawite; Aquifer

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作者: Jin, XY (Jin Xiao-Ying); Jin, HJ (Jin Hui-Jun); Iwahana, G (Iwahana, Go); Marchenko, SS (Marchenko, Sergey S.); Luo, DL (Luo Dong-Liang); Li, XY (Li Xiao-Ying); Liang, SH (Liang Si-Hai)

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摘要: Under a warming climate, degrading permafrost profoundly and extensively affects arctic and alpine ecology. However, most existing relevant studies are more focused on the hydrothermal impacts of vegetation on the underlying permafrost, or symbiosis between vegetation and permafrost, only very few on ecological impacts of permafrost degradation. Additionally, there are much more pertinent investigations in arctic and boreal regions than those in alpine and high-plateau regions at mid- and low latitudes. This study emphasizes on the impact mechanisms of permafrost degradation on vegetation both at high and mid-to low latitudes, addressing vegetation succession trajectories and associated changes in soil hydrology and soil nutrient above degrading permafrost. Permafrost degradation influences vegetation by altering soil hydrology, soil biogeochemical processes and microbial communities, which further improve soil nutrient availability. Furthermore, under a warming climate, vegetation may take two successional trajectories, towards a wetter or drier ecosystem within a certain time period, but to a drier ecosystem in the end upon the thaw of permafrost in case of permeable soils and good drainage. Thus, with rapidly developing remote-sensing and other space- and ground-based and air-borne observational networks and numerical predictive models, the impacting mechanisms of permafrost degradation on vegetation should be timely and better monitored, evaluated and modeled at desired spatiotemporal scales and resolutions by terrestrial or integrated ecosystem models.

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作者关键词: Degrading permafrost; Vegetation; Impact mechanisms; Climate warming; Ecological impacts

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标题: Selective-etching of MOF toward hierarchical porous Mo-doped CoP/N-doped carbon nanosheet arrays for efficient hydrogen evolution at all pH values

作者: Li, YN (Li, Yuanjian); Zhang, B (Zhang, Bao); Wang, WY (Wang, Wenyu); Shi, XJ (Shi, Xiaojun); Zhang, J (Zhang, Jin); Wang, R (Wang, Rui); He, BB (He, Beibei); Wang, Q (Wang, Qiang); Jiang, JJ (Jiang, Jianjun); Gong, YS (Gong, Yansheng); Wang, HW (Wang, Huanwen)

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摘要: CoP is demonstrated to be efficient for hydrogen evolution reaction (HER), but it suffers from unfavorable electronic and geometric structures to meet the requirement for future hydrogen economy. In this work, hierarchically porous N-doped carbon incorporated Mo-doped CoP nanosheet arrays are homogeneously grown on titanium foils (denoted as Mo-CoP/NC/TF) using a metal-organic-framework (MOF)-etching strategy. DFT simulations manifest that Mo dopants and N-doped carbon incorporation can synergistically modify the electronic structure of CoP, bringing optimal hydrogen adsorption free energies and accelerated interfacial charge transfer. Moreover, hierarchical nanoarray architectures can generate abundant accessible active sites, facile ion-diffusion path, and open-channels for gas release. Benefiting from these electronic and geometric advantages, the MoCoP/NC/TF electrocatalysts display superior activity and outstanding stability for pH-universal HER, requiring overpotentials of 59, 130, and 78 mV to drive a current density of 10 mA cm(-2) in acidic, neutral, and alkaline electrolytes, respectively, which rivals most of the state-of-the-art non-precious electrocatalysts. This work may inspire the design and exploration of highly active and durable electrocatalysts by synergistically tailoring electronic and geometric structures toward hydrogen evolution.

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作者关键词: Hydrogen evolution reaction; Cobalt phosphide; Nanoarray; Heteroatom doping; N-doped carbon

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作者: Qian, YQ (Qian, Yuqi); Xiao, L (Xiao, Long); Head, JW (Head, James W.); van der Bogert, CH (van der Bogert, Carolyn H.); Hiesinger, H (Hiesinger, Harald); Wilson, L (Wilson, Lionel)

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摘要: Chang'e-5, China's first lunar sample return mission, is targeted to land in northern Oceanus Procellarum, within a region selected on the basis of 1) its location away from the Apollo-Luna sampling region, 2) the presence of the Procellarum KREEP Terrane (PKT), 3) the occurrence of one of the youngest lunar mare basalts (Em4), and 4) its association with Rima Sharp. In order to provide context for returned sample analyses, we conducted a comprehensive study of the regional and global settings, geomorphology, composition, mineralogy, and chronology of the Em4 mare basalts. Superposed on Imbrian-aged low-Ti basalts, Em4 covers 37,000 km(2) and is composed of Eratosthenian-aged (similar to 1.53 Ga), high-Ti basalts with a mean thickness of similar to 51 m and a volume between similar to 1450 and 2350 km(3). Minor variations in TiO2 and FeO abundance occur within the unit and the thorium content averages similar to 6.7 ppm, typical of PKT mare basaltic regolith. No specific source vents (e.g., fissures, cones, domes) were found within the unit. We show that Rima Sharp is actually composed of three major rilles, whose source vents are located outside of, and which flow into, and merge in Em4, suggesting that they may be among the sources for Em4. Regolith thickness averages similar to 7 m and there is abundant evidence for vertical and lateral mixing; the most likely sources of distal ejecta are Aristarchus, Harpalus, and Sharp B craters. Returned samples from local and distant materials delivered by impact will thus provide significant new insights into lunar geochronology, inner Solar System impact fluxes, the age of very young mare basalts, the role of the PKT in the generation of mare basalts, the role of sinuous rilles in lava flow emplacement, and the thermal evolution of the Moon. (C) 2020 Elsevier B.V. All rights reserved.

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标题: Importance of meteorology in air pollution events during the city lockdown for COVID-19 in Hubei Province, Central China

作者: Shen, LJ (Shen, Lijuan); Zhao, TL (Zhao, Tianliang); Wang, HL (Wang, Honglei); Liu, JE (Liu, Jane); Bai, YQ (Bai, Yongqing); Kong, SF (Kong, Shaofei); Zheng, H (Zheng, Huang); Zhu, Y (Zhu, Yan); Shu, ZZ (Shu, Zhuozhi)

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摘要: Compared with the 21-year climatological mean over the same period during 2000-2020, the aerosol optical depth (AOD) and Angstrom exponent (AE) during the COVID-19 lockdown (January 24-February 29, 2020) decreased and increased, respectively, in most regions of Central-Eastern China (CEC). The AOD (AE) values decreased (increased) by 39.2% (29.4%) and 31.0% (45.3%) in Hubei and Wuhan, respectively, because of the rigorous restrictions. These inverse changes reflected the reduction of total aerosols in the air and the contribution of the increase in fine-mode particles during the lockdown. The surface PM2.5 had a distinct spatial distribution over CEC during the lockdown, with high concentrations in North China and East China. In particular, relatively high PM2.5 concentrations were notable in the lower flatlands of Hubei Province in Central China, where six PM2.5 pollution events were identified during the lockdown. Using the observation data and model simulations, we found that 50% of the pollution episodes were associated with the long-range transport of air pollutants from upstream CEC source regions, which then converged in the downstream Hubei receptor region. However, local pollution was dominant for the remaining episodes because of stagnant meteorological conditions. The long-range transport of air pollutants substantially contributed to PM2.5 pollution in Hubei, reflecting the exceptional importance of meteorology in regional air quality in China. (C) 2020 Elsevier B.V. All rights reserved.

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作者关键词: COVID-19; PM2.5 pollution; Meteorology; FLEXPART-WRF

KeyWords Plus: PARTICLE DISPERSION MODEL; YANGTZE-RIVER DELTA; REGIONAL HAZE EVENT; FORMATION MECHANISM; BOUNDARY-LAYER; BLACK CARBON; PM2.5; IMPACT; AEROSOL; VARIABILITY

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标题: A Disturbance Rejection Framework for Finite-Time and Fixed-Time Stabilization of Delayed Memristive Neural Networks

作者: Wang, LM (Wang, Leimin); Zeng, ZG (Zeng, Zhigang); Ge, MF (Ge, Ming-Feng)

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摘要: This paper proposes a unified framework to design sliding-mode control for stabilization of delayed memristive neural networks (DMNNs) with external disturbances. Under the presented framework, finite-time stabilization, and fixed-time stabilization of the controlled DMNNs can be, respectively, obtained by choosing different values for a specific control parameter. It is proved that the system responses can be made reaching the designed sliding-mode surface in finite and fixed time, and then stay on it. Moreover, it also illustrates that the inevitable external disturbances can be rejected by the designed sliding-mode control. Finally, the efficiency and superiority of the obtained main results are verified by comparisons with related works and numerical simulations.

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作者: Wang, ZL (Wang, Zhongli); Zhang, BG (Zhang, Baogang); He, C (He, Chao); Shi, JX (Shi, Jiaxin); Wu, MX (Wu, Mengxiong); Guo, JH (Guo, Jianhua)

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摘要: Although remediation of toxic vanadium (V) [V(V)] pollution can be achieved through either heterotrophic or sulfur-based autotrophic microbial reduction, these processes would require a large amount of organic carbons or generate excessive sulfate. This study reported that by using mixotrophic V(V) bioreduction with acetate and elemental sulfur [S(0)] as joint electron donors, V(V) removal performance was enhanced due to cooccurrence of heterotrophic and autotrophic activities. Deposited vanadium (IV) was identified as the main reduction product by scanning electron microscopy, energy-dispersive X-ray spectroscopy, X-ray diffraction and X-ray photoelectron spectroscopy. Based on 16S rRNA gene amplicon sequencing, qPCR and genus-specific reverse transcription qPCR, it was observed that V(V) was likely detoxified by heterotrophic V(V) reducers (e.g., Syntrophobacter, Spirochaeta and Geobacter). Cytochrome c, intracellular nicotinamide adenine dinucleotide and extracellular polymeric substances were involved in V(V) reduction and binding. Organic metabolites synthesized by autotrophs (e.g., Thioclava) with energy from S(0) oxidation might compensate electron donors for heterotrophic V(V) and sulfate reducers. Less sulfate was accumulated presumably due to activities of sulfur-respiring genera (e.g., Desulfurella). This study demonstrates mixotrophic microbial V(V) reduction can save organic dosage and avoid excessive sulfate accumulation, which will be beneficial to bioremediation of V(V) contamination. (C) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Vanadium (V); Bioremediation; Mixotrophic condition; Sulfur; Groundwater

KeyWords Plus: UTILIZING AUTOTROPHIC DENITRIFICATION; EXTRACELLULAR POLYMERIC SUBSTANCES; MICROBIAL COMMUNITY RESPONSES; WASTE-WATER; BIOELECTRICITY GENERATION; CARBON SOURCES; GROUNDWATER; REMOVAL; PRECIPITATION; BACTERIAL

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标题: Can new energy vehicles subsidy curb the urban air pollution? Empirical evidence from pilot cities in China

作者: Xie, Y (Xie, Yu); Wu, DS (Wu, Desheng); Zhu, SJ (Zhu, Shujin)

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摘要: New energy vehicles (NEVs) are considered as the potential measure to address urban air pollution, and the Chinese government has launched a pilot subsidy scheme to improve its market penetration. We explored the environmental effects of subsidy on urban air pollution from the extensive and intensive margins and formulated a detailed panel dataset, covering 286 cities in China over the years 2006-2018. Moreover, the PSM-DID method and the instrumental strategy are used to confirm the robustness and validity of empirical results on the basis of comprehensive analysis of potential endogenous issues. The results indicate that the implementation of NEVs subsidy policy could significantly improve urban air quality in general, and as the subsidies scale increased by 1%, air pollution level will be reduced by about 0.15%. Then, from the perspective of the dynamic effect of subsidy, it not only has remarkable current environmental effect, but also an effective technology route in the long run. Simultaneously, compared with traditional intervention tools, subsidies enhance the diffusion of NEVs, reduce emissions of air pollutants while meeting residents' travel needs, and thus achieve incentive compatibility, which is the micro-foundation of environmental improvement. Nonetheless, we cannot simply believe the assertion that NEVs subsidy has positive environmental benefits to each region, as the non-clean generation of electricity in some areas will offset the potential environmental benefits. Additionally, the accelerated phase-out of NEVs subsidies at this stage may cause negative externalities of economy and environment, resulting the dead-weight loss of industrial dividends accumulated in the early period. Based on above findings, governments should implement more flexible stimulus policies consistent with NEVs industry developments, rather than drastically reducing subsidies, while paying close attention to decarbonization of energy production stage. (C) 2020 Elsevier B.V. All rights reserved.

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作者关键词: Urban air quality; New energy vehicles; Incentive policy; Pilot city

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作者: Xie, YL (Xie, Yuanlong); Zhang, XL (Zhang, Xiaolong); Meng, W (Meng, Wei); Zheng, SQ (Zheng, Shiqi); Jiang, LQ (Jiang, Liquan); Meng, J (Meng, Jie); Wang, ST (Wang, Shuting)

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摘要: Recently, four-wheeled steerable mobile robots (FSMR) have attracted increasing attention in industrial fields, however the collision-free trajectory tracking control is still challenging in dynamic environments. This paper studies a new coupled fractional-order sliding mode control (CFSMC) and obstacle avoidance scheme, which has superior capacities of providing more control flexibilities and achieving high-accuracy. Instead of exploring traditional integer-order solutions, novel fractional-order sliding surfaces are proposed to handle the nonlinear interconnected states in a coupled structure. To accomplish non-oscillating avoidance of both stationary and moving entities within an uncertain workspace, a modified near-time-optimal potential function is subsequently presented with improved efficiency and reduced collision-resolving distances. By utilizing fuzzy rules, proper adaption gains of the reaching laws are designed to degenerate the effect of undesired chattering. The asymptotic stability and convergence can be guaranteed for the resultant closed-loop system. Three experiments are implemented on a real-time FSMR system. The results validate the reliability of the presented CFSMC scheme in terms of significantly mitigated following errors, faster disturbance rejection and smooth transition as compared to conventional methods. (c) 2020 ISA. Published by Elsevier Ltd. All rights reserved.

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作者关键词: Coupled fractional-order sliding mode control; Four-wheeled steerable mobile robot; Near-time-optimal potential function; Obstacle avoidance

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作者: Hu, C (Hu, Cheng); Tu, SC (Tu, Shuchen); Tian, N (Tian, Na); Ma, TY (Ma, Tianyi); Zhang, YH (Zhang, Yihe); Huang, HW (Huang, Hongwei)

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摘要: The efficient conversion of solar energy by means of photocatalysis shows huge potential to relieve the ongoing energy crisis and increasing environmental pollution. However, unsatisfactory conversion efficiency still hinders its practical application. The introduction of external fields can remarkably enhance the photocatalytic performance of semiconductors from the inside out. This review focuses on recent advances in the application of diverse external fields, including microwaves, mechanical stress, temperature gradient, electric field, magnetic field, and coupled fields, to boost photocatalytic reactions, for applications in, for example, contaminant degradation, water splitting, CO2 reduction, and bacterial inactivation. The relevant reinforcement mechanisms of photoabsorption, the transport and separation of photoinduced charges, and adsorption of reagents by the external fields are highlighted. Finally, the challenges and outlook for the development of external-field-enhanced photocatalysis are presented.

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作者关键词: charge separation; external fields; photocatalysis; semiconductors

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摘要: The Eocene-Oligocene transition (EOT) was a climate shift from a largely ice-free greenhouse world to an icehouse climate, involving the first major glaciation of Antarctica and global cooling occurring similar to 34 million years ago (Ma) and lasting similar to 790 kyr. The change is marked by a global shift in deep-sea delta O-18 representing a combination of deep-ocean cooling and growth in land ice volume. At the same time, multiple independent proxies for ocean temperature indicate sea surface cooling, and major changes in global fauna and flora record a shift toward more cold-climateadapted species. The two principal suggested explanations of this transition are a decline in atmospheric CO2 and changes to ocean gateways, while orbital forcing likely influenced the precise timing of the glaciation. Here we review and synthesise proxy evidence of palaeogeography, temperature, ice sheets, ocean circulation and CO2 change from the marine and terrestrial realms. Furthermore, we quantitatively compare proxy records of change to an ensemble of climate model simulations of temperature change across the EOT. The simulations compare three forcing mechanisms across the EOT: CO2 decrease, palaeogeographic changes and ice sheet growth. Our model ensemble results demonstrate the need for a global cooling mechanism beyond the imposition of an ice sheet or palaeogeographic changes. We find that CO2 forcing involving a large decrease in CO2 of ca. 40 % (similar to 325 ppm drop) provides the best fit to the available proxy evidence, with ice sheet and palaeogeographic changes playing a secondary role. While this large decrease is consistent with some CO2 proxy records (the extreme endmember of decrease), the positive feedback mechanisms on ice growth are so strong that a modest CO2 decrease beyond a critical threshold for ice sheet initiation is well capable of triggering rapid ice sheet growth. Thus, the amplitude of CO2 decrease signalled by our data-model comparison should be considered an upper estimate and perhaps artificially large, not least because the current generation of climate models do not include dynamic ice sheets and in some cases may be undersensitive to CO2 forcing. The model ensemble also cannot exclude the possibility that palaeogeographic changes could have triggered a reduction in CO2.

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作者: Chen, F (Chen, Fang); Ma, TY (Ma, Tianyi); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe); Huang, HW (Huang, Hongwei)

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摘要: Semiconductor-based photocatalysis as a productive technology furnishes a prospective solution to environmental and renewable energy issues, but its efficiency greatly relies on the effective bulk and surface separation of photoexcited charge carriers. Exploitation of atomic-level strategies allows in-depth understanding on the related mechanisms and enables bottom-up precise design of photocatalysts, significantly enhancing photocatalytic activity. Herein, the advances on atomic-level charge separation strategies toward developing robust photocatalysts are highlighted, elucidating the fundamentals of charge separation and transfer processes and advanced probing techniques. The atomic-level bulk charge separation strategies, embodied by regulation of charge movement pathway and migration dynamic, boil down to shortening the charge diffusion distance to the atomic-scale, establishing atomic-level charge transfer channels, and enhancing the charge separation driving force. Meanwhile, regulating the in-plane surface structure and spatial surface structure are summarized as atomic-level surface charge separation strategies. Moreover, collaborative strategies for simultaneous manipulation of bulk and surface photocharges are also introduced. Finally, the existing challenges and future prospects for fabrication of state-of-the-art photocatalysts are discussed on the basis of a thorough comprehension of atomic-level charge separation strategies.

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作者: Chen, BL (Chen, Bole); Conway, LJ (Conway, Lewis J.); Sun, WG (Sun, Weiguo); Kuang, XY (Kuang, Xiaoyu); Lu, C (Lu, Cheng); Hermann, A (Hermann, Andreas)

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摘要: Density functional theory calculations and crystal structure predictions using the particle swarm optimization method have been combined to determine stable hydrides of lead under pressure. In contrast to other group-IVa hydrides, the stoichiometry PbH6 is the first hydride to become stable, at just under 1 Mbar. For two previously studied stoichiometries, PbH4 and PbH8, energetically more favorable phases were identified to become stable around 2 Mbar. In all structures, the hydrogenic sublattices comprise negatively charged H-2(delta-) molecules. Competitive PbH4 and PbH6 structures are layered. PbH6 features H-2 molecules intercalated between hcp Pb layers, the stable phase of dense pure lead, thus offering a potentially straightforward route towards synthesis. In PbH8, the Pb lattice adapts a beta-Sn structure, and hydrogen atoms form quasi-one-dimensional-chains. All structures were found to be metallic and to feature superconductivity in their respective stability range, with moderately high T-c in the range 60-100 K for PbH4 and PbH6 and 161-178 K for PbH8.

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作者: Lunt, DJ (Lunt, Daniel J.); Bragg, F (Bragg, Fran); Chan, WL (Chan, Wing-Le); Hutchinson, DK (Hutchinson, David K.); Ladant, JB (Ladant, Jean-Baptiste); Morozova, P (Morozova, Polina); Niezgodzki, I (Niezgodzki, Igor); Steinig, S (Steinig, Sebastian); Zhang, ZS (Zhang, Zhongshi); Zhu, J (Zhu, Jiang); Abe-Ouchi, A (Abe-Ouchi, Ayako); Anagnostou, E (Anagnostou, Eleni); de Boer, AM (de Boer, Agatha M.); Coxall, HK (Coxall, Helen K.); Donnadieu, Y (Donnadieu, Yannick); Foster, G (Foster, Gavin); Inglis, GN (Inglis, Gordon N.); Knorr, G (Knorr, Gregor); Langebroek, PM (Langebroek, Petra M.); Lear, CH (Lear, Caroline H.); Lohmann, G (Lohmann, Gerrit); Poulsen, CJ (Poulsen, Christopher J.); Sepulchre, P (Sepulchre, Pierre); Tierney, JE (Tierney, Jessica E.); Valdes, PJ (Valdes, Paul J.); Volodin, EM (Volodin, Evgeny M.); Jones, TD (Jones, Tom Dunkley); Hollis, CJ (Hollis, Christopher J.); Huber, M (Huber, Matthew); Otto-Bliesner, BL (Otto-Bliesner, Bette L.)

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摘要: We present results from an ensemble of eight climate models, each of which has carried out simulations of the early Eocene climate optimum (EECO, similar to 50 million years ago). These simulations have been carried out in the framework of the Deep-Time Model Intercomparison Project (DeepMIP; http://www.deepmip.org , last access: 10 January 2021); thus, all models have been configured with the same paleogeographic and vegetation boundary conditions. The results indicate that these non-CO2 boundary conditions contribute between 3 and 5 degrees C to Eocene warmth. Compared with results from previous studies, the DeepMIP simulations generally show a reduced spread of the global mean surface temperature response across the ensemble for a given atmospheric CO2 concentration as well as an increased climate sensitivity on average. An energy balance analysis of the model ensemble indicates that global mean warming in the Eocene compared with the preindustrial period mostly arises from decreases in emissivity due to the elevated CO2 concentration (and associated water vapour and long-wave cloud feedbacks), whereas the reduction in the Eocene in terms of the meridional temperature gradient is primarily due to emissivity and albedo changes owing to the non-CO2 boundary conditions (i.e. the removal of the Antarctic ice sheet and changes in vegetation). Three of the models (the Community Earth System Model, CESM; the Geophysical Fluid Dynamics Laboratory, GFDL, model; and the Norwegian Earth System Model, NorESM) show results that are consistent with the proxies in terms of the global mean temperature, meridional SST gradient, and CO2, without prescribing changes to model parameters. In addition, many of the models agree well with the first-order spatial patterns in the SST proxies. However, at a more regional scale, the models lack skill. In particular, the modelled anomalies are substantially lower than those indicated by the proxies in the southwest Pacific; here, modelled continental surface air temperature anomalies are more consistent with surface air temperature proxies, implying a possible inconsistency between marine and terrestrial temperatures in either the proxies or models in this region. Our aim is that the documentation of the large-scale features and model-data comparison presented herein will pave the way to further studies that explore aspects of the model simulations in more detail, for example the ocean circulation, hydrological cycle, and modes of variability, and encourage sensitivity studies to aspects such as paleogeography, orbital configuration, and aerosols.

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摘要: Clear-sky solar radiation is an important indicator describing the potential of solar energy. The aerosols and water vapour, apart from geometrical/astronomical ones, are the main factors resulting in the losses of the surface solar radiation (SSR) under clear sky conditions. This study uses satellite aerosol data, reanalysis water vapour data, and the Mesoscale Atmospheric Irradiance Code to create the clear-sky SSR dataset for China in 2001-2015. The aerosol direct radiative effect (ADRE) and water vapour radiative effect (WVRE) are calculated to study the clear-sky SSR losses due to aerosols and water vapour. The coefficient of determination (R-2) of the observations and simulations is 0.944. The mean absolute error (MAE) and root mean square error (RMSE) are 6.67% and 9.00%, respectively. The strongest attenuation in clear-sky SSR due to aerosols occurs in April in most areas of China, while in June in North China and the Yangtze River Delta, water vapour most strongly attenuates the clear-sky SSR in July, and the monthly solar radiation losses due to water vapour are higher than those due to aerosols. The high aerosol and water vapour contents are the reasons why the clear-sky SSR in North China and the Yangtze River Delta in June are lower than those in May. From 2001 to 2015, the clear-sky trend with the greatest increase of up to 0.389 W m(-2) per year (2.48% in 15 years) occurs over central Inner Mongolia, which is related to the reduction in dust. The increasing concentration of particulate matter in the atmosphere results in the most significant decreasing clear-sky trend in North China (-0.510 W m(-2) year(-1), 3.35% in 15 years). Generally, the ADRE variations are the main factor controlling the annual variations in clear-sky SSR.

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摘要: Iceberg-trajectory models along with multi-proxy evidence from sediment cores from the Indian Ocean show that northward shifts in Antarctic iceberg melt redistributed freshwater in the Southern Ocean during the Pleistocene.

The dominant feature of large-scale mass transfer in the modern ocean is the Atlantic meridional overturning circulation (AMOC). The geometry and vigour of this circulation influences global climate on various timescales. Palaeoceanographic evidence suggests that during glacial periods of the past 1.5 million years the AMOC had markedly different features from today(1); in the Atlantic basin, deep waters of Southern Ocean origin increased in volume while above them the core of the North Atlantic Deep Water (NADW) shoaled(2). An absence of evidence on the origin of this phenomenon means that the sequence of events leading to global glacial conditions remains unclear. Here we present multi-proxy evidence showing that northward shifts in Antarctic iceberg melt in the Indian-Atlantic Southern Ocean (0-50 degrees E) systematically preceded deep-water mass reorganizations by one to two thousand years during Pleistocene-era glaciations. With the aid of iceberg-trajectory model experiments, we demonstrate that such a shift in iceberg trajectories during glacial periods can result in a considerable redistribution of freshwater in the Southern Ocean. We suggest that this, in concert with increased sea-ice cover, enabled positive buoyancy anomalies to 'escape' into the upper limb of the AMOC, providing a teleconnection between surface Southern Ocean conditions and the formation of NADW. The magnitude and pacing of this mechanism evolved substantially across the mid-Pleistocene transition, and the coeval increase in magnitude of the 'southern escape' and deep circulation perturbations implicate this mechanism as a key feedback in the transition to the '100-kyr world', in which glacial-interglacial cycles occur at roughly 100,000-year periods.

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摘要: The modeling of paleoclimate, using physically based tools, is increasingly seen as a strong out-of-sample test of the models that are used for the projection of future climate changes. New to the Coupled Model Intercomparison Project (CMIP6) is the Tier 1 Last Interglacial experiment for 127 000 years ago (lig127k), designed to address the climate responses to stronger orbital forcing than the mid-Holocene experiment, using the same state-of-the-art models as for the future and following a common experimental protocol. Here we present a first analysis of a multi-model ensemble of 17 climate models, all of which have completed the CMIP6 DECK (Diagnostic, Evaluation and Characterization of Klima) experiments. The equilibrium climate sensitivity (ECS) of these models varies from 1.8 to 5.6 degrees C. The seasonal character of the insolation anomalies results in strong summer warming over the Northern Hemisphere continents in the lig127k ensemble as compared to the CMIP6 piControl and much-reduced minimum sea ice in the Arctic. The multi-model results indicate enhanced summer monsoonal precipitation in the Northern Hemisphere and reductions in the Southern Hemisphere. These responses are greater in the lig127k than the CMIP6 midHolocene simulations as expected from the larger insolation anomalies at 127 than 6 ka.

New synthesis for surface temperature and precipitation, targeted for 127 ka, have been developed for comparison to the multi-model ensemble. The lig127k model ensemble and data reconstructions are in good agreement for summer temperature anomalies over Canada, Scandinavia, and the North Atlantic and for precipitation over the Northern Hemisphere continents. The model-data comparisons and mismatches point to further study of the sensitivity of the simulations to uncertainties in the boundary conditions and of the uncertainties and sparse coverage in current proxy reconstructions.

The CMIP6-Paleoclimate Modeling Intercomparison Project (PMIP4) lig127k simulations, in combination with the proxy record, improve our confidence in future projections of monsoons, surface temperature, and Arctic sea ice, thus providing a key target for model evaluation and optimization.

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摘要: Electrospun nanofibrous membranes (ENFMs) have many superior advantages, such as large specific surface area, high porosity, easy modification, good flexibility, and easy separation for recycling, which are consider as excellent adsorbents. In this paper, the research progress in the adsorption of heavy metals in water treatment by ENFMs is reviewed. Three types of ENFMs, including organic polymer ENFMs, organic polymer/inorganic material composite ENFMs and inorganic ENFMs are summarized, and their adsorption capacities for heavy metals in water are compared. The adsorption selectivity and capacity of ENFMs for heavy metals are depended largely on the type and number of functional groups on the surface of membranes, and usually the more the functional groups, the higher the adsorption capacity. The adsorption mechanisms of ENFMs are also mainly determined by the type of functional groups on the membrane. At present, the main challenge is to achieve the mass production of high-quality nanofibers and their actual application in the treatment of heavy metal-containing wastewater. Therefore, more consideration should be focused on the improvement of stability, mechanical strength and reusability of ENFMs. This review may provide an insight for the development of ENFMs-based adsorbents for heavy metals separation and water purification in the future.

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摘要: Purpose Land-use/cover management is one of the driven forces to induce soil erosion. Meanwhile, the loss of soil nutrients caused by soil erosion severely restricts soil fertility. However, the differences in soil nutrients under different land-use types in an erodible environment are complex and the factors are still unclear in tropical river basin.

Methods In the Mun River basin of Northeast Thailand, a total of six soil profiles were selected from the native forest, artificial forest, paddy land, and abandoned paddy lands with 1, 3, and 5-year abandoned history, respectively. The contents of soil nutrients, including soil organic carbon (SOC), soil organic nitrogen (SON), and inorganic minerals (Al2O3, CaO, Fe2O3, K2O, MgO, and MnO), in the soil profiles were analyzed to determine their distribution under different land-use types. Soil erodibility K factor was calculated by the erosion productivity impact calculator (EPIC) model to estimate the potential of soil erosion under different land-use types. Moreover, the relationships between soil nutrients and the K factor were determined by linear regression analysis and Spearman's rank correlation analysis.

Results The silty soils under artificial forest were significantly larger for the contents of SOC, SON, Al2O3, Fe2O3, and MnO than the sandy soils under native forest, which was mainly attributed to the abundant fine particles in the silty soils. Fine particles played a key role in being the main carriers of inorganic minerals and combining with organic matter. The contents of SOC, SON, and all inorganic minerals in the soils of the abandoned paddy lands were significantly lower than those in the paddy field, resulting from the severe loss of fine particles under intense soil erosion. The soils with abundant fine particles under the native forest land and paddy land had significantly higher K factors compared to the coarse-textured soils under other land-use types. The K factor was mainly controlled by the proportion of fine particles in the Mun River basin. The paddy field easily occurred severe soil erosion at the early stage (1 year) of paddy land abandonment due to the lack of protective management, which caused decreasing SOC, SON, and inorganic minerals with the loss of fine particles. However, the K2O, MgO, and CaO contents significantly increased after 3 similar to 5 years of paddy land abandonment through the supplement from high salinity groundwater.

Conclusions These results suggest that continual paddy cultivation can effectively maintain soil nutrients in the sandy soils of the tropical river basin.

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标题: Thrusting, exhumation, and basin fill on the western margin of the South China block during the India-Asia collision

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摘要: The pattern and timing of deformation in southeast Tibet resulting from the early stages of the India-Asia collision are crucial factors to understand the growth of the Tibetan Plateau, but they remain poorly constrained. Detailed field mapping, structural analysis, and geochronological and thermochronological data along a 120 km section of the Ludian-Zhonghejiang foldand-thrust belt bounding the Jianchuan basin in western Yunnan, China, document the early Cenozoic tectonic evolution of the conjunction between the Lanping-Simao and South China blocks. The study area is cut by two major southwest-dipping brittle faults, named the Ludian-Zhonghejiang fault and the Tongdian fault from east to west. Numerous kinematic indicators and the juxtaposition of Triassic metasedimentary rocks on top of Paleocene strata indicate thrusting along the Ludian-Zhonghejiang fault. Similarly, structural analysis shows that the Tongdian fault is a reverse fault. Between these structures, fault-bounded Permian-Triassic and Paleocene rocks are strongly deformed by nearly vertical and upright southwestvergent folds with axes that trend nearly parallel to the traces of the main faults. Zircon and apatite (U-Th)/He and apatite fission-track data from a Triassic pluton with zircon U-Pb ages of 237-225 Ma in the hanging wall of the Ludian-Zhonghejiang fault, assisted by inverse modeling, reveal two episodes of accelerated cooling during 125-110 Ma and 50-39 Ma. The Cretaceous cooling event was probably related to crustal thickening during the collision between the Lhasa and Qiangtang terranes. The accelerated exhumation during 50-39 Ma is interpreted to record the life span of the fold-and-thrust belt. This timing is corroborated by the intrusive relationship of Eocene magmas of ca. 36-35 Ma zircon U-Pb age into the fold-and-thrust belt. Early Cenozoic activity of the deformation system controlled deposition of alluvial-fan and braided-river sediments in the Jianchuan basin, as evidenced by eastward and northeastward paleoflows and terrestrial clasts derived from the hanging wall of the Ludian-Zhonghejiang thrust. Since 39 Ma, decreasing cooling rates likely reflect cessation of activity on the fold-and-thrust belt. Early Cenozoic compressive deformation on the western margin of the South China block together with geological records of contraction in central, northern, and eastern Tibet document Eocene upper-crustal shortening located in the Himalaya, Qiangtang terrane, and northern plateau margins together with contractional basin development in the intervening Lhasa, Songpan-Garze, and Kunlun terranes, coeval with or shortly after the onset of the India-Asia collision. This suggests that moderate crustal shortening affected a large part of Tibet in a spaced way, contrary to models of homogeneous crustal thickening soon after the collision, and prior to the main crustal thickening, propagating progressively from south to north. This complex deformation pattern illustrates the complexity of Asian crustal rheology, which contrasts with assumptions in existing geodynamic models.

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标题: Common Problems and Pitfalls in Fluid Inclusion Study: A Review and Discussion

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摘要: The study of fluid inclusions is important for understanding various geologic processes involving geofluids. However, there are a number of problems that are frequently encountered in the study of fluid inclusions, especially by beginners, and many of these problems are critical for the validity of the fluid inclusion data and their interpretations. This paper discusses some of the most common problems and/or pitfalls, including those related to fluid inclusion petrography, metastability, fluid phase relationships, fluid temperature and pressure calculation and interpretation, bulk fluid inclusion analysis, and data presentation. A total of 16 problems, many of which have been discussed in the literature, are described and analyzed systematically. The causes of the problems, their potential impact on data quality and interpretation, as well as possible remediation or alleviation, are discussed.

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作者关键词: fluid inclusions; fluid inclusion assemblage; FIA; metastability; immiscibility; boiling; heterogeneous trapping; daughter mineral; fluid pressure; depth estimation

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摘要: The combination of thermal stress and ocean acidification (OA) can more negatively affect coral calcification than an individual stressors, but the mechanism behind this interaction is unknown. We used two independent methods (microelectrode and boron geochemistry) to measure calcifying fluid pH (pH(cf)) and carbonate chemistry of the corals Pocillopora damicornis and Stylophora pistillata grown under various temperature and pCO(2) conditions. Although these approaches demonstrate that they record pH(cf) over different time scales, they reveal that both species can cope with OA under optimal temperatures (28 degrees C) by elevating pH(cf) and aragonite saturation state (Omega(cf)) in support of calcification. At 31 degrees C, neither species elevated these parameters as they did at 28 degrees C and, likewise, could not maintain substantially positive calcification rates under any pH treatment. These results reveal a previously uncharacterized influence of temperature on coral pH(cf) regulation-the apparent mechanism behind the negative interaction between thermal stress and OA on coral calcification.

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标题: Land Use Transition and Driving Forces in Chinese Loess Plateau: A Case Study from Pu County, Shanxi Province

作者: Huang, H (Huang, Han); Zhou, Y (Zhou, Yang); Qian, MJ (Qian, Mingjie); Zeng, ZQ (Zeng, Zhaoqi)

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摘要: Land use transition is essentially one of the manifestations of land use/cover change (LUCC). Although a large number of studies have focused on land use transitions on the macro scale, there are few studies on the micro scale. Based on the data of two high-resolution land use surveys, this study used a land use transfer matrix and GeoDetector model to explore the spatial-temporal patterns and driving forces of land use transitions at the village level in Pu County over a ten-year period. Results show that Pu County has experienced a drastic process of land use transition. More than 80% of cropland and grassland have been converted to forest land, and over 90% of the expansion of built-up land came from the occupation of forest land, cropland, and grassland. The driving forces of land use transition and its magnitude depended on the type of land use. The implementation of the policy of returning farmland to forest, or grain-for-green (GFG) was the main driving force for the large-scale conversion of cultivated land to forest land in Pu County. In the context of policy of returning farmland to forests, the hilly and gully regions of China's Loess Plateau must balance between protecting the ecology and ensuring food security. Promoting the comprehensive consolidation of gully land and developing modern agriculture may be an important way to achieve a win-win goal of ecological protection and food security.

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摘要: The interaction between epidemic spreading and information diffusion is an interdisciplinary research problem. During an epidemic, people tend to take self-protective measures to reduce the infection risk. However, with the diffusion of rumor, people may be difficult to make an appropriate choice. How to reduce the negative impact of rumor and to control epidemic has become a critical issue in the social network. Elaborate mathematical model is instructive to understand such complex dynamics. In this paper, we develop a two-layer network to model the interaction between the spread of epidemic and the competitive diffusions of information. The results show that knowledge diffusion can eradicate both rumor and epidemic, where the penetration intensity of knowledge into rumor plays a vital role. Specifically, the penetration intensity of knowledge significantly increases the thresholds for rumor and epidemic to break out, even when the self-protective measure is not perfectly effective. But eradicating rumor shouldn't be equated with eradicating epidemic. The epidemic can be eradicated with rumor still diffusing, and the epidemic may keep spreading with rumor being eradicated. Moreover, the communication-layer network structure greatly affects the spread of epidemic in the contact-layer network. When people have more connections in the communication-layer network, the knowledge is more likely to diffuse widely, and the rumor and epidemic can be eradicated more efficiently. When the communication-layer network is sparse, a larger penetration intensity of knowledge into rumor is required to promote the diffusion of knowledge. (C) 2020 Elsevier Inc. All rights reserved.

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作者关键词: Multi-layer network; Competitive information diffusions; Epidemic spreading; Self-protection; Outbreak threshold

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标题: Superpixel-Based Reweighted Low-Rank and Total Variation Sparse Unmixing for Hyperspectral Remote Sensing Imagery

作者: Li, H (Li, Hao); Feng, RY (Feng, Ruyi); Wang, LZ (Wang, Lizhe); Zhong, YF (Zhong, Yanfei); Zhang, LP (Zhang, Liangpei)

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摘要: Sparse unmixing, as a semisupervised unmixing method, has attracted extensive attention. The process of sparse unmixing involves treating the mixed pixels of hyperspectral imagery as a linear combination of a small number of spectral signatures (endmembers) in a standard spectral library, associated with fractional abundances. Over the past ten years, to achieve a better performance, sparse unmixing algorithms have begun to focus on the spatial information of hyperspectral images. However, less accurate spatial information greatly limits the performance of the spatial-regularization-based sparse unmixing algorithms. In this article, to overcome this limitation and obtain more reliable spatial information, a novel sparse unmixing algorithm named superpixel-based reweighted low-rank and total variation (SUSRLR-TV) is proposed to enhance the performance of the traditional spatial-regularization-based sparse unmixing approaches. In the proposed approach, superpixel segmentation is adopted to consider both the spatial proximity and the spectral similarity. In addition, a low-rank constraint is enforced on the objective function as pixels within each superpixel have the same endmembers and similar abundance values, and they naturally satisfy the low-rank constraint. Differing from the traditional nuclear norm, a reweighted nuclear norm is used to achieve a more efficient and accurate low-rank constraint. Meanwhile, low-rank consideration is also used to enhance the spatial continuity and suppress the effects of random noise. Furthermore, TV regularization is introduced to promote the smoothness of the abundance maps. Experiments on three simulated data sets, as well as a well-known real hyperspectral imagery data set, confirm the superior performance of the proposed method in both the qualitative assessment and the quantitative evaluation, compared with the state-of-the-art sparse unmixing methods.

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作者关键词: Hyperspectral imaging; Libraries; Correlation; TV; Sparse matrices; Hyperspectral remote sensing; reweighted low-rank constraint; simple linear iterative clustering (SLIC); sparse unmixing; superpixels; total variation (TV)

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标题: Biomarker evidence of algal-microbial community changes linked to redox and salinity variation, Upper Devonian Chattanooga Shale (Tennessee, USA)

作者: Song, Y (Song, Yi); Gilleaudeau, GJ (Gilleaudeau, Geoffrey J.); Algeo, TJ (Algeo, Thomas J.); Over, DJ (Over, D. Jeffrey); Lyons, TW (Lyons, Timothy W.); Anbar, AD (Anbar, Ariel D.); Xie, SC (Xie, Shucheng)

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摘要: Late Devonian marine systems were characterized by major environmental perturbations and associated biotic community changes linked to climate change and widespread oceanic anoxia. Here, we provide high-resolution lipid biomarker chemostratigraphic records from the Upper Devonian Chattanooga Shale (Tennessee, USA) to investigate algal-microbial community changes in the southern Illinois Basin that were related to contemporaneous shifts in marine redox (as proxied by trace metals, Fe-species, and C-org/P) and salinity conditions (as proxied by B/Ga, Sr/Ba, and S/total organic carbon). The Frasnian was characterized by dominantly bacterial lipids (high hopane/sterane), near-marine salinity, and a shift from oxic to increasingly reducing conditions in response to increasing organic carbon sinking fluxes. Aryl isoprenoids and aryl isoprenoid ratios reveal that the O-2-H2S chemocline was unstable and intermittently shallow (i.e., within the photic zone). The Frasnian-Famennian boundary was marked by a shift in microalgal community composition toward green algal (e.g., prasinophyte) dominance (lower C-27 and higher C-28 and C-29 steranes), a sharp reduction in watermass salinity, and a stable O-2-H2S chemocline below the photic zone, conditions that persisted until nearly the end of the Famennian. We infer that changing watermass conditions, especially a sharp reduction in salinity to possibly low-brackish conditions (<10 psu), were the primary cause of concurrent changes in the microalgal community, reflecting tolerance of low-salinity conditions by green algae. Transient spikes in moretane/hopane (M/H) ratios may record enhanced terrestrial weathering at the Frasnian-Famennian and Devonian-Carboniferous boundaries, triggered by coeval glacioeustatic falls and increased inputs of soil organic matter. High Mill and pristane/phytane, in combination with low chemical index of alteration and K/Al, record a decrease in chemical weathering intensity during the Famennian that may have been due to contemporaneous climatic cooling, and a concurrent reduction in silt content may reflect stabilization of land surfaces by vascular plants and resulting reduced sediment yields. This study demonstrates the effectiveness of combining organic and inorganic geochemical proxies (including novel paleosalinity indices) for determination of environmental controls on the composition and productivity of plankton communities in paleomarine systems.

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标题: Ordo-Silurian assemblage in the Indochina interior: Geochronological, elemental, and Sr-Nd-Pb-Hf-O isotopic constraints of early Paleozoic granitoids in South Laos

作者: Wang, YJ (Wang, Yuejun); Zhang, YZ (Zhang, Yuzhi); Qian, X (Qian, Xin); Senebouttalath, V (Senebouttalath, Vongpaseuth); Wang, Y (Wang, Yang); Wang, YK (Wang, Yukun); Gan, CS (Gan, Chengshi); Zaw, K (Zaw, Khin)

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摘要: In order to verify the early Paleozoic accretionary assemblage in the Indochina interior and constrain the Prototethyan tectonic evolution in Southeast Asia, this study presents a set of new U-Pb geochronological, elemental, and Sr-Nd-Pb-Hf-O isotopic data for the fifty-two representative granitoids in South Laos. The granitoids from the Kontum terrane, Tam Ky-Phuoc Son tectonic zone, and southern Truong Son igneous zone in South Laos yield the crystallization ages of 464-485 Ma, 455-471 Ma, and 427-446 Ma, respectively, with a northerly younging trend within the Indochina interior. They are mainly monzogranite with A/CNK = 0.96-1.99 and K2O > Na2O, which are marked by enrichment in largeion lithophile elements and depletion in high field strength elements with remarkable NbTa, Sr-P, and Ti negative anomalies. Their initial Sr-87/Sr-86 ratios range from 0.70510 to 0.71559, epsilon(Nd)(t) from -9.5 to -3.0(Pb-206/Pb-204) from 18.65 to 19.72, (Pb-207/Pb-204) from 15.66 to 15.80, and (Pb-208/Pb-204), from 38.84 to 39.79. The corresponding zircon epsilon(Hf)(t) and delta O-18 values are in the range of -10.6 to +1.0 and 6.88 parts per thousand to 8.94 parts per thousand, respectively. In addition, their Sr-Nd-Pb and Hf-O isotopic compositions are generally similar with those of time-equivalent granitoids in South Tibet and SW Yunnan, China, and synchronous mafic-intermediate igneous rocks in South Laos, but distinctive from those of the supracrustal sedimentary-derived South China Paleozoic granite and Lincang-Sukhothai S-type granite. The early Paleozoic granitoids in South Laos might have originated from a mixed source of the wedge-derived juvenile crust coupled with supracrustal materials. All these data synthetically suggest the southward subduction of the Tam Ky-Phuoc Son Ocean and the northerly on-growing Ordo-Silurian accretionary orogenesis within the previously defined "single-ancient" Indochina block. The assemblage of the Indochina block might initiate at ca. 430 Ma in the Silurian and terminate in the Early-Middle Devonian.

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标题: Onset of plate tectonics by the Eoarchean

作者: Windley, BF (Windley, Brian F.); Kusky, T (Kusky, Tim); Polat, A (Polat, Ali)

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摘要: One of the most contentious areas of Earth Science today is when, or whether or not modern-style plate tectonics was in operation in the Archean Eon. In this review we present evidence that the onset of plate tectonics was not at 3.2 Ga, as popularly conceived, but was in operation during the Eoarchean by at least ca. 4.0 Ga. Following a review of the main Eoarchean supracrustal belts of the world, constrained by relevant geochemical/isotopic data, we present evidence that suggests that from at least ca. 4.0 Ga Earth produced considerable juvenile mafic crust and consequent island arcs by Accretionary Cycle Plate Tectonics. From similar to 3.2 Ga there was a gradual transition in geodynamics to more abundant active continental margin magmatism in the form of voluminous TTGs and sanukitoids. From 3.2 Ga to 2.5 Ga juvenile oceanic crust and arcs continued to form, accompanied by more active continental margin magmatism until similar to 2.7-2.5 Ga, by which time there were sufficient crustal rocks to amalgamate into incipient large continents, the fragmentation of which started the first complete classical Wilson Cycle Plate Tectonics of breaking apart and re-assembling large continental masses. In other words, there were two types of plate tectonics in operation in the early Earth, Accretionary Cycle Plate Tectonics and Wilson Cycle Plate Tectonics, but Wilson Cycle type plate interactions only became more common after contiguous continental landmass became voluminous and extensive enough around 2.7-2.5 Ga. Failure to realize this dual mechanism of continental growth may lead to erroneous ideas such as "plate tectonics started at 3.2 Ga", or "mantle plumes generated early Archean magmatic rocks." We present new geochemical data that together with lithological and structural relationships, negate the various plume-type speculations including stagnant lids, heat pipes, and mushy-lid tectonics. It is interesting to consider that the way Earth's crust developed in the first Gigayear of the geological record continued later, albeit in more advanced forms, into the Phanerozoic, where we can still recognize Accretionary Cycle Plate Tectonics and orogens still with short boundaries in examples including the Altaids of Central Asia, the Arabian-Nubian Shield, the Japanese Islands, and in incipient form in Indonesia, as well as Wilson Cycle Plate Tectonics that leads inexorably to continental collisions as in the Alpine-Himalayan orogen with its long plate boundaries. We recommend this holistic view of crustal growth and the evolution of continents that leads to a robust, viable, and testable model of Earth evolution.

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摘要: Urea electro-oxidation is an attractive and alternative anodic reaction in the electrochemical generation of hydrogen using wastewater ascribing to the low theoretical voltage and non-precious metal (nickel) catalyst for urea oxidation reaction (UOR); however, the sluggish UOR and poisoning of catalyst impede the practical application. Here, in this work, we synthesize a series of nickel nanoparticles embedded nitrogen doped carbon nanotubes (Ni@NCNT) and study the effect of nitrogen dopants on UOR catalytic activity. The nitrogen dopants can weaken the binding strength between CO2 species and active sites resulting in alleviation of CO2 poisoning; simultaneously, nitrogen dopants also promote the in-situ conversion of Ni3+ species facilitating UOR catalysis; as a result, electrocatalytic current density of 45.8 mA cm(-2) is recorded for Ni@NCNT in 1 M KOH electrolyte with 0.5 M urea at 1.5 V vs. RHE, which is 3.8 fold better than commercial PVC (11.8 mA cm(-2)). Moreover, Ni@ NCNT, due to the more nitrogen dopants, exhibits a comparable overpotential to commercial PVC for driving hydrogen evolution reaction (HER) catalysis in 1 M KOH electrolyte at high current density (400 mA cm(-2)). Subsequently, 1.56 V is demanded for overall UOR catalysis on Ni@NCNT with current density of 10 mA cm(-2). This work offers useful information for designing a stable and efficient electrocatalyst for not only UOR but also electrochemical generation of H-2 from wastewater.

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语言: English

文献类型: Article

作者关键词: Urea oxidation reaction; Hydrogen evolution reaction; Nitrogen dopant; CO2 adsorption strength

KeyWords Plus: EFFICIENT BIFUNCTIONAL ELECTROCATALYSTS; METAL-FREE ELECTROCATALYST; HYDROGEN EVOLUTION; HYDROXIDE NANOSHEETS; ANODE CATALYSTS; ROBUST; ELECTROOXIDATION; PEROVSKITE; GRAPHENE; ARRAYS

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输出日期: 2022-01-19

标题: The prevalence and risk factors of psychological disturbances of frontline medical staff in china under the COVID-19 epidemic: Workload should be concerned

作者: Zhou, YJ (Zhou, Yongjie); Wang, WJ (Wang, Wenjuan); Sun, YP (Sun, Yanping); Qian, W (Qian, Wei); Liu, ZK (Liu, Zhengkui); Wang, RX (Wang, Ruoxi); Qi, L (Qi, Ling); Yang, JZ (Yang, Jiezhi); Song, XL (Song, Xiuli); Zhou, X (Zhou, Xin); Zeng, LY (Zeng, Lingyun); Liu, TB (Liu, Tiebang); Li, ZZ (Li, Zezhi); Zhang, XY (Zhang, Xiangyang)

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使用次数 (2013 年至今): 60

引用的参考文献数: 27

摘要: Background: To our best knowledge, this was the first time to investigate the prevalence and risk factors of psychological disturbances, including depression, anxiety, somatization symptoms, insomnia and suicide, among frontline medical staff, who were working with the COVID-10 infected patients directly.

Methods: Patient Health Questionnaire Depression (PHQ-9), Generalized Anxiety Disorder Questionnaire scale (GAD-7), Symptom Check List-90 (SCL-90) somatization, Insomnia Severity Index (ISI), and the suicidal module of the Mini International Neuropsychiatric Interview were used for online survey.

Results: A total of 606 frontline hospital staff and1099 general population were recruited. The prevalence of depression, anxiety, somatization symptoms, insomnia, and suicide risk in frontline medical staffs were 57.6%, 45.4%, 12.0%, 32.0% and 13.0%, respectively. Except for suicide risk, the prevalence of other psychological disorders in frontline medical staff were higher than those in general population (all p<0.01). Among the frontline medical staff, the daily working hours were associated with all psychological disturbance (allp<0.01), women with anxiety (p = 0.02), body mass index (BMI) with anxiety and insomnia (p = 0.02, p = 0.03). Age was negatively associated with depression, anxiety, and insomnia (all p<0.01). Finally, years of working and family income were negatively associated with suicide risk (p = 0.03, p<0.001).

Conclusion: Our study demonstrates that during the outbreak of COVID-19, the frontline medical staff are more likely to suffer from psychological disturbances than general population. It is noticeable that daily working hours are a risk factor for all measured psychological disturbances, and some other variables may be involved in certain psychological disturbances of frontline medical staff.

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PubMed ID: 32882508

语言: English

文献类型: Article

作者关键词: Covid-19; Health workers; Psychosocial disturbances; Prevalence; Risk factor

KeyWords Plus: BODY-MASS INDEX; SLEEP QUALITY; HEALTH; WUHAN

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标题: Record-Breaking Meiyu Rainfall Around the Yangtze River in 2020 Regulated by the Subseasonal Phase Transition of the North Atlantic Oscillation

作者: Liu, BQ (Liu, Boqi); Yan, YH (Yan, Yuhan); Zhu, CW (Zhu, Congwen); Ma, SM (Ma, Shuangmei); Li, JY (Li, Jianying)

来源出版物: GEOPHYSICAL RESEARCH LETTERS 卷: 47 期: 22 文献号: e2020GL090342 DOI: 10.1029/2020GL090342 出版年: NOV 28 2020

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摘要: In 2020, the Yangtze River (YR) suffered a long-persisting Meiyu season. The accumulated rainfall broke its record since 1961 and caused severe flooding and death in China. Our results show the sequential warm and cold Meiyu front regulated by the North Atlantic Oscillation (NAO) was responsible for this unexpected extreme Meiyu event. From 11 to 25 June with the positive NAO, the interaction between the South Asian High (SAH) and the western Pacific subtropical high maintained a warm front to strengthen the rainband north of the YR. Afterward, the coupling between SAH and midlatitude Mongolian Cyclone induced a cold front, which retreated the rainband to the south of YR from 30 June to 13 July with the negative NAO. Although the ECMWF S2S model successfully predicted the warm-front-related Meiyu rainband, it failed to forecast the Meiyu rainband in the cold-front period, suggesting a great challenge of S2S forecasting on Meiyu rainfall.

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语言: English

文献类型: Article

KeyWords Plus: ASIAN SUMMER MONSOON; INTERANNUAL VARIABILITY; INTRASEASONAL OSCILLATION; EAST; CLIMATE; FRONT; PREDICTABILITY; DYNAMICS; ONSET

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ESI 热点论文: N

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标题: Multi-View Multi-Label Learning With Sparse Feature Selection for Image Annotation

作者: Zhang, YS (Zhang, Yongshan); Wu, J (Wu, Jia); Cai, ZH (Cai, Zhihua); Yu, PLS (Yu, Philip S.)

来源出版物: IEEE TRANSACTIONS ON MULTIMEDIA 卷: 22 期: 11 页: 2844-2857 DOI: 10.1109/TMM.2020.2966887 出版年: NOV 2020

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摘要: In image analysis, image samples are always represented by multiple view features and associated with multiple class labels for better interpretation. However, multiple view data may include noisy, irrelevant and redundant features, while multiple class labels can be noisy and incomplete. Due to the special data characteristic, it is hard to perform feature selection on multi-view multi-label data. To address these challenges, in this paper, we propose a novel multi-view multi-label sparse feature selection (MSFS) method, which exploits both view relations and label correlations to select discriminative features for further learning. Specifically, the multi-labeled information is decomposed into a reduced latent label representation to capture higher level concepts and correlations among multiple labels. Multiple local geometric structures are constructed to exploit visual similarities and relations for different views. By taking full advantage of the latent label representation and multiple local geometric structures, the sparse regression model with an l2,1-norm and an Frobenius norm (F-norm) penalty terms is utilized to perform hierarchical feature selection, where the F-norm penalty performs high-level (i.e., view-wise) feature selection to preserve the informative views and the l2,1-norm penalty conducts low-level (i.e., rowwise) feature selection to remove noisy features. To solve the proposed formulation, we also devise a simple yet efficient iterative algorithm. Experiments and comparisons on real-world image datasets demonstrate the effectiveness and potential of MSFS.

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语言: English

文献类型: Article

作者关键词: Feature extraction; Correlation; Noise measurement; Kernel; Learning systems; Computer science; Task analysis; Feature selection; sparse learning; multi-view learning; multi-label learning; image annotation

KeyWords Plus: UNSUPERVISED FEATURE-SELECTION; INFORMATION

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标题: Redox classification and calibration of redox thresholds in sedimentary systems

作者: Algeo, TJ (Algeo, Thomas J.); Li, C (Li, Chao)

来源出版物: GEOCHIMICA ET COSMOCHIMICA ACTA 卷: 287 特刊: SI 页: 8-26 DOI: 10.1016/j.gca.2020.01.055 出版年: OCT 15 2020

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使用次数 (2013 年至今): 59

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摘要: Existing redox classifications and the calibrations of elemental proxies to modern environmental redox scales are in need of re-evaluation. Here, we review environmental redox classifications, commonly used elemental redox proxies, and their inter calibration, and we propose a novel approach to improve the calibration of such proxies, using datasets from the modern Black Sea, Saanich Inlet, and California Margin as examples. Our approach is based on recognition of compound covariation patterns among pairs of elemental redox proxies within a redox framework based on three key thresholds: (1) the Re4+/Re3- couple near the suboxidized/subreduced boundary of the suboxic zone, (2) the U6+/U4+ couple in the middle of the subreduced zone, and (3) the SO42-/H2S couple at the suboxic/euxinic boundary. Within this framework, it is possible to determine the relative timing of onset and the degree of enrichment of other elemental redox proxies. Our analysis demonstrates that, even though some elements exhibit limited enrichment within the suboxic zone, the bulk of authigenic enrichment of the redox-sensitive elements considered in this study occurs within the euxinic zone. One important finding of our study is that the threshold value associated with a given elemental proxy can vary considerably between depositional systems. For this reason, it is inadvisable to transfer published threshold values (i.e., from earlier paleoredox studies) to completely different formations, and redox proxies must be internally calibrated for each individual paleodepositional system under investigation. (c) 2020 Elsevier Ltd. All rights reserved.

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作者关键词: Anoxia; Euxinia; Molybdenum; Uranium; Rhenium; DOP

KeyWords Plus: OXYGEN-MINIMUM ZONE; IRON PALEOREDOX PROXIES; SAANICH INLET; TRACE-METALS; MARINE-SEDIMENTS; BIOGEOCHEMICAL CYCLES; INORGANIC NITROGEN; WATER OXYGENATION; CHEMICAL FACTORS; PYRITE FORMATION

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标题: Elemental proxies for paleosalinity analysis of ancient shales and mudrocks

作者: Wei, W (Wei, Wei); Algeo, TJ (Algeo, Thomas J.)

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摘要: Salinity is a fundamental property of watermasses that is useful in paleoenvironmental and paleoecological studies, yet the theory of application of geochemical proxies to paleosalinity reconstruction is underdeveloped. Here, we explore the use of three elemental ratios for paleosalinity reconstruction: boron/gallium (B/Ga), strontium/barium (Sr/Ba), and sulfur/total organic carbon (S/TOC) ratios. We compiled a large set of modern aqueous and sedimentary chemical data representing a range of salinity facies (i.e., freshwater, brackish, marine) in order to test the relationships of these proxies to ambient watermass salinity and to determine their viability for paleosalinity analysis. Sediment data were limited to fine-grained siliciclastic units (muds/shales/mudstones) without significant carbonate content, in which the elements of interest were mainly acquired through adsorption of dissolved species, forging a connection between elemental proxy values and watermass chemistry. In modern systems, watermass salinity is correlated with these proxies, yielding r of +0.99 and +0.76 for aqueous and sediment B/Ga, +0.66 and +0.54 for aqueous and sediment Sr/Ba, and +0.98 for aqueous sulfate and +0.66 for sediment S/TOC (all significant at p(alpha) < 0.01). These relationships establish the basis for use of these elemental ratios as paleosalinity proxies. Elemental crossplots permitted estimation of approximate salinity thresholds for each proxy: (1) B/Ga is <3 in freshwater, 3-6 in brackish, and >6 in marine facies; (2) Sr/Ba is <0.2 in freshwater, 0.2-0.5 in brackish, and >0.5 in marine facies; and (3) S/TOC is <0.1 in freshwater and >0.1 in brackish and marine facies. S/TOC did not discriminate effectively between brackish and marine facies, probably because microbial sulfate reduction (MSR) is generally C-org-limited rather than sulfate-limited in both facies. The accuracies of these thresholds for prediction of the salinity facies of sediments are similar to 88% for B/Ga, similar to 66% for Sr/Ba, and similar to 91% for S/TOC. Although the Sr/Ba proxy is slightly less robust owing to difficulty in removing all carbonate Sr influence and/or to greater mobility of Sr and Ba in the burial environment, we strongly advocate use of multiple proxies in order to support paleosalinity interpretations. Finally, we illustrate the application of these proxies with case studies of (1) the Ordos Basin in North China, which contains Ordovician marine shales and Triassic terrestrial mudstones, and (2) the mid-Eocene Bohai Bay Basin in NE China, which accumulated brackish to marine mudstones. (C) 2019 Elsevier Ltd. All rights reserved.

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语言: English

文献类型: Article

作者关键词: Boron; B/Ga; Sr/Ba; Brackish; Freshwater; Seawater

KeyWords Plus: BORON ISOTOPE GEOCHEMISTRY; THERMOCHEMICAL SULFATE REDUCTION; BIOGENIC BARIUM FLUXES; SOUTHERN ORDOS BASIN; DEEP-SEA SEDIMENT; BOHAI BAY BASIN; ORGANIC-MATTER; FRESH-WATER; TRACE-ELEMENTS; DISSOLVED GALLIUM

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标题: Significant changes in the chemical compositions and sources of PM2.5 Wuhan since the city lockdown as COVID-19

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摘要: Wuhan was the first city to adopt the lockdown measures to prevent COVID-19 spreading, which improved the air quality accordingly. This study investigated the variations in chemical compositions, source contributions, and regional transport of fine particles (PM2.5) during January 23-February 22 of 2020, compared with the same period in 2019. The average mass concentration of PM2.5 decreased from 72.9 mu g m(-3) (2019) to 45.9 mu g m(-3) (2020), by 27.0 mu g m(-3). It was predominantly contributed by the emission reduction (92.0%), retrieved from a random forest tree approach. The main chemical species of PM2.5 all decreased with the reductions ranging from 0.85 mu g m(-3) (chloride) to 9.86 mu g m(-3) (nitrate) (p < 0.01). Positive matrix factorization model indicated that the mass contributions of seven PM2.5 sources all decreased. However, their contribution percentages varied from -11.0% (industrial processes) to 8.70% (secondary inorganic aerosol). Source contributions of PM2.5 transported from potential geographical regions showed reductions with mean values ranging from 0.22 to 436 mu g m(-3). However, increased contributions of firework burning, secondary inorganic aerosol, road dust, and vehicle emissions from transboundary transport were observed. This study highlighted the complex and nonlinear response of chemical compositions and sources of PM2.5 to air pollution control measures, suggesting the importance of regional-joint control. (C) 2020 Elsevier B.V. All rights reserved.

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作者: Liu, B (Liu, Bo); Song, Y (Song, Yu); Zhu, K (Zhu, Kai); Su, P (Su, Peng); Ye, X (Ye, Xiang); Zhao, WC (Zhao, Wanchun)

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摘要: The Middle Permian Lucaogou Formation in the Santanghu Basin (northwest China) develops one of the thickest salinized lacustrine organic-rich shale (SLOPS) in the world. The SLOPS has been proven as sources for crude oil and tight oil, as well as sources and reservoirs for shale oil in the basin. A total of 52 SLOPS samples were collected from the second member of Lucaogou Formation (P(2)l(2)), and analyzed by mineralogy and element geochemistry, in order to reveal the paleoenvironment, provenance, tectonic setting and shale oil potential. The results imply an evolution of paleoenvironment from anoxic, saline to dysoxic-oxic, freshwater lake, which is caused by an increased freshwater influx. Early in the P(2)l(2), volcanic ash and hydrothermal fluids have increased the nutrient level in the lake and therefore elevated the bioproductivity. The P(2)l(2) SLORS is originated from intermediate volcanic rocks, accompanied by minor proportions of basic volcanic rocks. The parent rocks of P(2)l(2) SLORS have experienced weak degree of chemical weathering, and probably derived from a continental island arc setting. Micro-, nano-pores (inter-grain pores, inter-crystalline pores, dissolution pores and organic matter pores) and microfractures are widely observed in the P(2)l(2) SLORS, which provides sufficient storage space for hydrocarbons. The P(2)l(2) SLORS is dominated by carbonate minerals, quartz and feldspar, which are all brittle minerals and favourable for artificial fracturing. Comprehensive study indicates that the upper P(2)l(2) SLORS hosts a better shale oil potential, due to the relatively high TOC, abundant micropores and microfractures, and high brittle mineral contents. In addition, individual element geochemical parameters in the Santanghu Basin should be used with caution, for example, the paleoredox proxy U/Th and paleosalinity proxy Sr/Ba are also influenced by volcanic and hydrothermal activity. This implies that a multi-proxy analysis should be applied during the study of paleoenvironmental conditions.

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作者: Wang, PP (Wang, Peipei); Zheng, XQ (Zheng, Xinqi); Li, JY (Li, Jiayang); Zhu, BR (Zhu, Bangren)

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摘要: COVID-19 has now had a huge impact in the world, and more than 8 million people in more than 100 countries are infected. To contain its spread, a number of countries published control measures. However, it's not known when the epidemic will end in global and various countries. Predicting the trend of COVID-19 is an extremely important challenge. We integrate the most updated COVID-19 epidemiological data before June 16, 2020 into the Logistic model to fit the cap of epidemic trend, and then feed the cap value into FbProphet model, a machine learning based time series prediction model to derive the epidemic curve and predict the trend of the epidemic. Three significant points are summarized from our modeling results for global, Brazil, Russia, India, Peru and Indonesia. Under mathematical estimation, the global outbreak will peak in late October, with an estimated 14.12 million people infected cumulatively. (C) 2020 Elsevier Ltd. All rights reserved.

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作者: Furnes, H (Furnes, Harald); Dilek, Y (Dilek, Yildirim); Zhao, GC (Zhao, Guochun); Safonova, I (Safonova, Inna); Santosh, M (Santosh, M.)

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摘要: Ophiolites are important archives of oceanic crust development and preservation in the rock record, and the Alpine-Himalayan Orogenic Belt (AHOB) is one of the most comprehensive ophiolite depositories in earth's history. We have compiled published data on the field occurrences and geochemistry from 137 AHOB ophiolites, ranging in age from Triassic through Cretaceous, in order to characterize the nature of the Mesozoic Neotethyan oceanic crust. We have used in this synthesis our recent ophiolite classification approach and applied the most effective geochemical discrimination diagrams to categorize the Neotethyan ophiolites within the AHOB. The subduction-related, Backarc (BA), Forearc (FA), Backarc to Forearc (BA-FA) and Volcanic Arc (VA) ophiolites exhibit different geochemical features, with the BA and FA types defining the end-members with low-high and high subduction influence, respectively. The subduction-related ophiolites constitute 76% of the ophiolite record in the AHOB, with the BA type ophiolites being the most dominant group (43%), followed by the BA-FA (19%) and with FA and VA types as subordinate groups (8% and 6%, respectively). The subduction-unrelated ophiolites, making up 24% of the AHOB ophiolite archive, include Mid-Ocean Ridge (MOR), Continental Margin, and Plume type ophiolites. The MOR type comprises 19% of this total and is the dominant type in the western part of the AHOB. Both major ophiolite categories are commonly associated with tholeiitic to alkaline ocean island basalt (OIB) associations, which represent the remnants of plume-proximal magmatism in different Neotethyan seaways. Subduction-unrelated ophiolites in the westernmost end of the Neotethyan realm were derived from downgoing oceanic plates, and were involved in high-pressure, subduction zone metamorphism prior to their exhumation along the suture zones. Subduction-related ophiolites, derived from the upper plates at Neotethyan convergent margins, escaped such high-pressure metamorphism and extreme fragmentation during their emplacement. Therefore, their complete Penrose ophiolite stratigraphy with greenschist facies metamorphic overprint is commonly well preserved in the collision zones of the AHOB. Different subduction contributions (from zero to 100% in the MOR and FA, respectively) may attest to variable slab dip angles and fluctuations in slab-induced elements and sediments into the mantle melt source of ophiolite-forming magmas.

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摘要: Medical images acquired from different modalities give rise to many practical problems in image registration. Intensity-based registration techniques have been increasingly used in multimodal image registration; these techniques integrate different images that have shared content into a single representation, by transformation. The estimation of the optimal transformation requires the optimization of a similarity metric between the images. Recently, many optimization methods have been proposed that focus on the development of the optimization component. However, there is still room for large amounts of improvement, from both an efficiency point of view and a quality perspective. In this paper we present a new Biogeography-based Optimization (BBO) algorithm, the Biogeography-based Optimization algorithm with Elite Learning (BBO-EL), for multimodal medical image registration. First, we propose a hybrid full migration operator in which each individual has the chance to perform the migration operation and the whole population has the chance to expand the search space. In this way, the search ability of the BBO algorithm is enhanced and matches well the characteristics of multimodal medical image registration. In addition, considering that the quality of some individuals could be deteriorated as caused by the migration operation, we propose an undo operator on the deteriorated individuals. Thus, the lower bound of the whole population's quality can be maintained at a higher level. Furthermore, in the original BBO algorithm, a number of good individuals might be not involved in the migration operation, and we present an elite learning operator that is based on social comparison theory to improve the upper bound of the whole population's quality. Therefore, after improving both the lower bound and the upper bound of the whole population's quality, the accuracy and the convergence speed of the multimodal medical registration can be greatly enhanced. The BBO-EL has been tested in many experiments on benchmark datasets include six kind of different modality images, from up to eighteen different patients, which can make up 54 multimodal registration scenarios. The BBO-EL obtained 30 best performance scenarios while the state-of-the-art algorithm obtained 21 scenarios. The results demonstrated that BBO-EL outperforms the state-of-the-art algorithm in most cases for practical problems. (C) 2020 Elsevier B.V. All rights reserved.

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KeyWords Plus: SEGMENTATION APPROACH; OPTIMIZATION; INTENSITY; ROBUST; EFFICIENT

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标题: Comparisons of heuristic, general statistical and machine learning models for landslide susceptibility prediction and mapping

作者: Huang, FM (Huang, Faming); Cao, ZS (Cao, Zhongshan); Guo, JF (Guo, Jianfei); Jiang, SH (Jiang, Shui-Hua); Li, S (Li, Shu); Guo, ZZ (Guo, Zizheng)

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摘要: Commonly used data-driven models for landslide susceptibility prediction (LSP) can be mainly classified as heuristic, general statistical or machine learning models. This study plans to compare the prediction performance of these data-driven models on the landslide susceptibility mapping, thus further to explore the inherently features of these data-driven models. As a result, a more accurate and reliable LSP can be realized through choosing an optimal data-based model. A heuristic model represented by the analytic hierarchy process (AHP), a general statistical model represented by the general linear model (GLM) and information value (IV) model, and machine learning models represented by binary logistic regression (BLR), Multilayer Perceptron (MLP), backpropagation neural network (BPNN), support vector machine (SVM) and C5.0 decision tree (C5.0 DT) are adopted in this study. Shicheng County in China is used as the study area. In total, 369 landslides identified through field investigation are classified as training (70%) and testing datasets (30%). Next, 13 landslide conditioning factors (elevation, slope, aspect, plan curvature, profile curvature, relief amplitude, total surface radiation, population density, Normalized difference vegetation index, distance to river, topographic wetness index and rock types) are acquired from data sources of the free remote sensing images, Digital Elevation Model, field investigation and government reports. The correlations between these conditioning factors and the landslide locations are determined by frequency ratio analysis. Then, the landslide susceptibility indexes (LSIs) calculated by the eight trained models are imported into GIS software to produce landslide susceptibility maps of Shicheng County. Finally, the area under receiver operating characteristic curve (AUC), the calculated LSIs are applied to assess the LSP performance of the present eight models. The testing results show that these eight models generate reasonable LSP results as a whole, further showing that the C5.0 DT is of the highest prediction accuracy with an AUC value of 0.868, followed by the SVM (0.813), BPNN (0.803), MLP (0.792), BLR (0.784), GLM (0.779), IV (0.774) and AHP (0.773). It can be inferred that the machine learning models have higher LSP performance than general statistical and heuristic models due to its high AUC accuracy and reasonable LSIs distribution features, while general statistical model is limited by its linear analysis and heuristic model is limited by subjective weighting process.

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KeyWords Plus: SUPPORT VECTOR MACHINE; ANALYTICAL HIERARCHY PROCESS; ARTIFICIAL NEURAL-NETWORK; DECISION-TREE; FREQUENCY RATIO; LOGISTIC-REGRESSION; SPATIAL PREDICTION; 3 GORGES; RANDOM FOREST; AREA

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作者: Merghadi, A (Merghadi, Abdelaziz); Yunus, AP (Yunus, Ali P.); Dou, J (Dou, Jie); Whiteley, J (Whiteley, Jim); ThaiPham, B (Binh ThaiPham); Bui, DT (Dieu Tien Bui); Avtar, R (Avtar, Ram); Abderrahmane, B (Abderrahmane, Boumezbeur)

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摘要: Landslides are one of the catastrophic natural hazards that occur in mountainous areas, leading to loss of life, damage to properties, and economic disruption. Landslide susceptibility models prepared in a Geographic Information System (GIS) integrated environment can be key for formulating disaster prevention measures and mitigating future risk. The accuracy and precision of susceptibility models is evolving rapidly from opinion-driven models and statistical learning toward increased use of machine learning techniques. Critical reviews on opinion-driven models and statistical learning in landslide susceptibility mapping have been published, but an overview of current machine learning models for landslide susceptibility studies, including background information on their operation, implementation, and performance is currently lacking. Here, we present an overview of the most popular machine learning techniques available for landslide susceptibility studies. We find that only a handful of researchers use machine learning techniques in landslide susceptibility mapping studies. Therefore, we present the architecture of various Machine Learning (ML) algorithms in plain language, so as to be understandable to a broad range of geoscientists. Furthermore, a comprehensive study comparing the performance of various ML algorithms is absent from the current literature, making an assessment of comparative performance and predictive capabilities difficult. We therefore undertake an extensive analysis and comparison between different ML techniques using a case study from Algeria. We summarize and discuss the algorithm's accuracies, advantages and limitations using a range of evaluation criteria. We note that tree-based ensemble algorithms achieve excellent results compared to other machine learning algorithms and that the Random Forest algorithm offers robust performance for accurate landslide susceptibility mapping with only a small number of adjustments required before training the model.

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标题: Secular change and the onset of plate tectonics on Earth

作者: Palin, RM (Palin, Richard M.); Santosh, M (Santosh, M.); Cao, WT (Cao, Wentao); Li, SS (Li, Shan-Shan); Hernandez-Uribe, D (Hernandez-Uribe, David); Parsons, A (Parsons, Andrew)

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摘要: The Earth as a planetary system has experienced significant change since its formation c. 4.54 Gyr ago. Some of these changes have been gradual, such as secular cooling of the mantle, and some have been abrupt, such as the rapid increase in free oxygen in the atmosphere at the Archean-Proterozoic transition. Many of these changes have directly affected tectonic processes on Earth and are manifest by temporal trends within the sedimentary, igneous, and metamorphic rock record. Indeed, the timing of global onset of mobile-lid (subduction-driven) plate tectonics on our planet remains one of the fundamental points of debate within the geosciences today, and constraining the age and cause of this transition has profound implications for understanding our own planet's long-term evolution, and that for other rocky bodies in our solar system. Interpretations based on various sources of evidence have led different authors to propose a very wide range of ages for the onset of subduction-driven tectonics, which span almost all of Earth history from the Hadean to the Neoproterozoic, with this uncertainty stemming from the varying reliability of different proxies. Here, we review evidence for paleo-subduction preserved within the geological record, with a focus on metamorphic rocks and the geodynamic information that can be derived from them. First, we describe the different types of tectonic/geodynamic regimes that may occur on Earth or any other silicate body, and then review different models for the thermal evolution of the Earth and the geodynamic conditions necessary for plate tectonics to stabilize on a rocky planet. The community's current understanding of the petrology and structure of Archean and Proterozoic oceanic and continental crust is then discussed in comparison with modern-day equivalents, including how and why they differ. We then summarize evidence for the operation of subduction through time, including petrological (metamorphic), tectonic, and geochemical/isotopic data, and the results of petrological and geodynamical modeling. The styles of metamorphism in the Archean are then examined and we discuss how the secular distribution of metamorphic rock types can inform the type of geodynamic regime that operated at any point in time. In conclusion, we argue that most independent observations from the geological record and results of lithospheric-scale geodynamic modeling support a global-scale initiation of plate tectonics no later than c. 3 Ga, just preceding the Archean-Proterozoic transition. Evidence for subduction in Early Archean terranes is likely accounted for by localized occurrences of plume-induced subduction initiation, although these did not develop into a stable, globally connected network of plate boundaries until later in Earth history. Finally, we provide a discussion of major unresolved questions related to this review's theme and provide suggested directions for future research.

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作者关键词: Archean; Subduction; Plate tectonics; Geodynamics; Metamorphism

KeyWords Plus: NORTH CHINA CRATON; HIGH-PRESSURE GRANULITES; ISUA GREENSTONE-BELT; ARCHEAN CONTINENTAL-CRUST; TERRESTRIAL MAGMA OCEAN; ECLOGITE-FACIES ROCKS; PALEOPROTEROZOIC NAGSSUGTOQIDIAN OROGEN; LITHOSPHERE-ASTHENOSPHERE BOUNDARY; ULTRAHIGH-TEMPERATURE METAMORPHISM; SIMPLE THERMODYNAMIC MODEL

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作者: Shen, J (Shen, Jun); Feng, QL (Feng, Qinglai); Algeo, TJ (Algeo, Thomas J.); Liu, JL (Liu, Jinling); Zhou, CY (Zhou, Chenyang); Wei, W (Wei, Wei); Liu, JS (Liu, Jiangsi); Them, TR (Them, Theodore R., II); Gill, BC (Gill, Benjamin C.); Chen, JB (Chen, Jiubin)

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摘要: Mercury (Hg) concentration enrichments have become a widely used proxy for volcanic inputs to sediments, especially for investigation of ancient large igneous province (LIP) eruptions. Its application for this purpose requires normalization to an element representing the dominant host phase of Hg-generally total organic carbon (TOC) for the organic fraction, but occasionally total sulfur (TS) or aluminum (Al) for the sulfide or clay fractions, respectively. Hg studies generally assume an organic matter host, but recent work has demonstrated that sulfide or clay fraction host phases are not uncommon, making it essential to determine formation-specific Hg host phases. Here, we investigate Hg concentrations and their relationships to TOC, TS, and Al in four modern marine settings (Black Sea, Japan Sea, Saanich Inlet, and Peru Margin) and six ancient marine formations (from Lower Cambrian to Lower Jurassic). Multiple regression analysis (MRA) shows that the organic fraction is the dominant host of Hg in all of the modern marine sediments examined here, as well as in many ancient marine units, although in some of the latter Hg resides primarily in the sulfide fraction (i.e., lower Cambrian and Upper Ordovician units) or partly in the clay mineral fraction (Middle Permian) of the sediment. A sulfide host phase is more likely in strongly euxinic depositional facies, as reflected in high TS concentrations (>1.0%) and TS/TOC ratios (> similar to 0.35). This study thus demonstrates the importance of determining Hg host phases in sediments prior to normalization and use of Hg as a volcanic proxy. (C) 2020 Elsevier B.V. All rights reserved.

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摘要: The orogenic gold deposits along the NNW-trending Ailaoshan shear zone are formed during Miocene continental collision, after a complex history of Neoproterozoic subduction, Late Triassic amalgamation between the Indochina and South China blocks after closure of the Paleo-Tethyan Ocean, and Oligocene-Eocene continental-scale shearing related to the Indian-Eurasian continental collision. As a result, the eastern Neoproterozoic basement with ductile shear zones was thrust over the western metasedimentary rocks and Paleo-Tethyan ophiolites affected by brittle faulting. These tectonically juxtaposed successions were underlain by lithosphere metasomatized in the Neoproterozoic. The gold-hosting western succession is characterized by tightly folded Silurian to Permian metasedimentary rocks, overlain by gently folded Late Triassic metasedimentary rocks, and cut by secondary NW-trending shear zones. This crustal architecture controlled migration of ore fluid towards the cessation of regional ductile deformation at ca. 22 Ma, with major ductile shear zones serving as the main conduit, tight folds, and jogs or intersections on subsidiary brittle shear zones as the fluid trap, and Late Triassic rocks as the seal. Gold-rich rims on disseminated gold-poor sedimentary pyrite with a limited delta S-34 range from - 3 to 3 parts per thousand, pyrite He-Ar isotope ratios, and the timing of mineralization within retrograde metamorphism suggest an important metal contribution from mantle lithosphere. The auriferous fluid, derived from previously metasomatized mantle lithosphere, is interpreted to have advected up the Ailaoshan shear zone into the metasedimentary sequence during mantle upwelling, clearly contrasting with widely accepted crustal metamorphic models for Phanerozoic orogenic gold deposits.

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PubMed ID: 31634057

语言: English

文献类型: Article

KeyWords Plus: RIVER SHEAR ZONE; ZIRCON U-PB; ARC/BACK-ARC ASSEMBLAGES; SHAN METAMORPHIC COMPLEX; PALEO-TETHYS OROGEN; LEFT-LATERAL SHEAR; WESTERN YUNNAN; SW CHINA; GEOCHEMICAL CONSTRAINTS; SOUTH CHINA

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Preliminary copper isotope study on particulate matter in Zhujiang River, southwest China: Application for source identification

作者: Zeng, J (Zeng, Jie); Han, GL (Han, Guilin)

来源出版物: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 卷: 198 文献号: 110663 DOI: 10.1016/j.ecoenv.2020.110663 出版年: JUL 15 2020

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摘要: Copper (Cu) is not only an essential metallic element for human and organisms, but also a toxic and pernicious element when its environmental content exceeds a certain threshold. However, to date, little is known about the isotopic compositions and sources of Cu in the suspended particulate matter (SPM) of fluvial ecosystems. To identify the potential sources of Cu in SPM in Zhujiang River (an important river in southwestern China with about 30 million people in the entire basin), we reported the Cu contents of SPM and the Cu isotopic compositions (expressed in delta Cu-65) at 22 sites. The relative contribution rates of potential sources were also calculated based on the mixing model. The results indicate that the Cu contents varied from 14 mg kg(-1) to 96 mg kg(-1) with a relatively low enrichment factor (EF) value (mean value is 1.6). The amount of Cu transferred as suspended loads ranged from 5% to 98% (mean value 60%) in the sampling period. The EF and delta Cu-65 suggest a ternary mixture of fluvial SPM with the delta Cu-65 value fluctuating from 0.04 parts per thousand to 0.50 parts per thousand (mean value 0.17 parts per thousand). Based on isotope ratios and mass balance equation, we calculate that the rock weathering contributes 76.4% particulate Cu in Zhujiang River, and the contributions of urban sludge and smelting tailings are 15.4% and 8.2%, respectively. These findings regarding to the application of Cu isotope have significant implications for tracing the Cu sources, which significantly supports the control and management of suspended particulate copper pollution in large rivers.

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语言: English

文献类型: Article

作者关键词: Copper isotope; Enrichment; Suspended particulate matter; Source contribution; Zhujiang river

KeyWords Plus: XIJIANG RIVER; HEAVY-METAL; CONTAMINATION SOURCES; TRACE-METALS; CU ISOTOPES; SEDIMENT; FRACTIONATION; WATER; IRON; ZN

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标题: Exergoeconomic optimization of a new double-flash geothermal-based combined cooling and power (CCP) system at two different cooling temperatures assisted by boosters

作者: Tian, MW (Tian, Man-Wen); Parikhani, T (Parikhani, Towhid); Jermsittiparsert, K (Jermsittiparsert, Kittisak); Ashraf, MA (Ashraf, Muhammad Aqeel)

来源出版物: JOURNAL OF CLEANER PRODUCTION 卷: 261 文献号: 120921 DOI: 10.1016/j.jclepro.2020.120921 出版年: JUL 10 2020

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摘要: A new cooling/power cogeneration system applicable to double-flash geothermal power plants is devised which provides cooling load at two different adjustable cooling temperatures. To further increase efficiency of the set-up, two boosters are employed to boost pressure of the secondary flow of each ejector due to the considerable drop of pressure of the geofluid through the steam turbines as well as the throttling valves. A comprehensive modeling of the proposed system is achieved from thermodynamics laws as well as economic perspectives and the results are elaborated with more details. In comparison with the previous integrated systems based on the flash geothermal power plants, the present system produces around 47.8% more cooling load and 38.9% more electricity. Also, the results of multi-objective optimization revealed that the net electrical power and exergetic efficiency can be increased approximately 20.59% and 68.11%, respectively. However, the unit cost of power and cooling (UCPC) is decreased around 36.3%. Meantime, the total exergy destruction rate is decreased after optimization. Among all elements, the highest exergy destruction occurred in the condenser by 2570 kW out of 7609 kW (in base mode) and 2333 kW out of 6836 kW (in optimum mode). Also, it is found that the energy efficiency of the proposed system can be increased by increasing turbines outlet pressure, boosters pressure ratio, and separator 1 pressure or decreasing separator 2 pressure. (C) 2020 Elsevier Ltd. All rights reserved.

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语言: English

文献类型: Article

作者关键词: Flash-binary geothermal; Cogeneration; Bi-evaporator; Exergoeconomic optimization

KeyWords Plus: THERMOECONOMIC ANALYSIS; MULTIGENERATION SYSTEM; PERFORMANCE ASSESSMENT; REFRIGERATION CYCLE; HEAT-SOURCE; ENERGY; EXERGY; DRIVEN

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输出日期: 2022-01-19

标题: Cooperation of oxygen vacancies and 2D ultrathin structure promoting CO2 photoreduction performance of Bi4Ti3O12

作者: Liu, LZ (Liu, Lizhen); Huang, HW (Huang, Hongwei); Chen, F (Chen, Fang); Yu, HJ (Yu, Hongjian); Tian, N (Tian, Na); Zhang, YH (Zhang, Yihe); Zhang, TR (Zhang, Tierui)

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摘要: Reduction of CO2 to solar fuels by artificial photosynthesis technology has attracted considerable attention. However, insufficient separation of charge carriers and weak CO2 adsorption hamper the photocatalytic CO2 reduction activity. Herein, we tackle these challenges by introducing oxygen vacancies (OVs) on the two-dimensional Bi4Ti3O12 ultrathin nanosheets via a combined hydrothermal and postreduction process. Selective photodeposition experiment of Pt over Bi4Ti3O12 discloses that the ultrathin structure shortens the migration distance of photo-induced electrons from bulk to the surface, benefiting the fast participation in the CO2 reduction reaction. The introduction of OVs on ultrathin Bi4Ti3O12 nanosheets leads to enormous amelioration on surface state and electronic structure, thereby resulting in enhanced CO2 adsorption, photoabsorption and charge separation efficiency. The photocatalytic experiments uncover that ultrathin Bi4Ti3O12 nanosheets with OVs reveal a largely enhanced CO2 photoreduction activity for producing CO with a rate of 11.7 mu mol g(-1) h(-1) in the gas-solid system, similar to 3.2 times higher than that of bulk Bi4Ti3O12. This work not only yields efficient ultrathin photocatalysts with OVs, but also furthers our understanding on enhancing CO2 reduction via cooperative tactics. (C) 2020 Science China Press. Published by Elsevier B.V. and Science China Press. All rights reserved.

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语言: English

文献类型: Article

作者关键词: CO2 photoreduction; Oxygen vacancies; Ultrathin nanosheets; Charge separation; Bismuth titanate

KeyWords Plus: PHOTOCATALYTIC REDUCTION; EFFICIENT; BIOCL

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输出日期: 2022-01-19

标题: Facet-charge-induced coupling dependent interfacial photocharge separation: A case of BiOI/g-C3N4 p-n junction

作者: Tian, N (Tian, Na); Huang, HW (Huang, Hongwei); Wang, SB (Wang, Shuobo); Zhang, TR (Zhang, Tierui); Du, X (Du, Xin); Zhang, YH (Zhang, Yihe)

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摘要: Heterojunction photocatalyst fabrication benefits the improvement of photocatalytic activity. However, the influence of different coupling facets receives less attention. Herein, two p-n junctions with different coupling facets of BiOI, denoted as B001/CN002 and B110/CN002(+), were constructed by a simple precipitation method. In B001/CN002, BiOI nanosheets parallel combined with g-C3N4 with the {001} facet of BiOI and (002) plane of g-C3N4. After being treated by CTAB, the (002) plane of g-C3N4 shows positive charge (g-C3N4+), and the BiOI nanosheets were vertically assembled onto g-C3N4+. The results of photodegradation on multiform industrial contaminants and antibiotic revealed that B001/CN002 shows much higher photoactivity than g-C 3 N. 4 , g-C3N4+, BiOI and B110/CN002(+). The substantially facilitated charge separation and transfer at the interface of B001/ CN002 promote the generation of O-1(2) and center dot O-2(-), accounting for the excellent photocatalytic activity. The study may provide a new perspective on designing heterostructured photocatalytic materials via facet-charge-induced interfacial engineering strategy.

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语言: English

文献类型: Article

作者关键词: Facets coupling; BiOI; g-C3N4; Interfacial charge separation; Photodegradation

KeyWords Plus: CONTROLLED HYDROTHERMAL SYNTHESIS; LIGHT PHOTOCATALYTIC DEGRADATION; GRAPHITIC CARBON NITRIDE; REACTABLE IONIC LIQUID; 001 ACTIVE FACETS; NANOCOMPOSITES SYNTHESIS; OXYIODIDE COMPOSITES; FACILE SYNTHESIS; KEY ROLE; BIOX X

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输出日期: 2022-01-19

标题: Different sampling strategies for predicting landslide susceptibilities are deemed less consequential with deep learning

作者: Dou, J (Dou, Jie); Yunus, AP (Yunus, Ali P.); Merghadi, A (Merghadi, Abdelaziz); Shirzadi, A (Shirzadi, Ataollah); Nguyen, H (Hoang Nguyen); Hussain, Y (Hussain, Yawar); Avtar, R (Avtar, Ram); Chen, Y (Chen, Yulong); Pham, BT (Binh Thai Pham); Yamagishi, H (Yamagishi, Hiromitsu)

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摘要: Predictive capability of landslide susceptibilities is assumed to be varied with different sampling techniques, such as (a) the landslide scarp centroid, (b) centroid of landslide body, (c) samples of the scrap region representing the scarp polygon, and (d) samples of the landslide body representing the entire landslide body. However, new advancements in statistical and machine learning algorithms continuously being updated the landslide susceptibility paradigm. This paper explores the predictive performance power of different sampling techniques in landslide susceptibility mapping in the wake of increased usage of artificial intelligence. We used logistic regression (LR), neural network (NNET), and deep learning neural network (DNN) model for testing and validation of the models. The tests were applied to the 2018 Hokkaido Earthquake affected areas using a set of 11 predictor variables (seismic, topographic, and hydrological). We found that the prediction rates are inconsequential with the DNN model irrespective of the sampling technique (AUC: 0.904 - 0.919). Whereas, testing with LR (AUC: 0.825 - 0.785) and NNET (AUC: 0.882 - 0.858) produces larger differences in the accuracies between the four datasets. Nonetheless, the highest success rates were obtained for samples within the landslide scarp area. The analogy was then validated with a published landslide inventory from the 2015 Gorkha earthquake. We, therefore, suggest that DNN models as an appropriate technique to increase the predictive performance of landslide susceptibilities if the landslide scarp and body are not characterized properly in an inventory. (C) 2020 Elsevier B.V. All rights reserved.

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作者关键词: Susceptibility; Landslide sampling strategies; Deep learning; Lidar DEM; M(w)6.6 Hokkaido earthquake

KeyWords Plus: 2018 HOKKAIDO; REGRESSION-MODEL; EARTHQUAKE; ALGORITHMS; GENERATION; ISLAND; MAPS

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标题: Mining spatiotemporal association patterns from complex geographic phenomena

作者: He, ZJ (He, Zhanjun); Deng, M (Deng, Min); Cai, JN (Cai, Jiannan); Xie, Z (Xie, Zhong); Guan, QF (Guan, Qingfeng); Yang, C (Yang, Chao)

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摘要: Spatiotemporal association pattern mining can discover interesting interdependent relationships among various types of geospatial data. However, existing mining methods for spatiotemporal association patterns usually model geographic phenomena as simple spatiotemporal point events. Therefore, they cannot be applied to complex geographic phenomena, which continuously change their properties, shapes or locations, such as storms and air pollution. The most salient feature of such complex geographic phenomena is the geographic dynamic. To fully reveal dynamic characteristics of complex geographic phenomena and discover their associated factors, this research proposes a novel complex event-based spatiotemporal association pattern mining framework. First, a complex geographic event was hierarchically modeled and represented by a new data structure named directed spatiotemporal routes. Then, sequence mining technique was applied to discover the spatiotemporal spread pattern of the complex geographic events. An adaptive spatiotemporal episode pattern mining algorithm was proposed to discover the candidate driving factors for the occurrence of complex geographic events. Finally, the proposed approach was evaluated by analyzing the air pollution in the region of Beijing-Tianjin-Hebei. The experimental results showed that the proposed approach can well address the geographic dynamic of complex geographic phenomena, such as the spatial spreading pattern and spatiotemporal interaction with candidate driving factors.

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作者关键词: Spatial data mining; spatiotemporal association patterns; complex geographic phenomena; geographic dynamics

KeyWords Plus: CO-LOCATION PATTERNS; DATA SETS; COLOCATION PATTERNS; RULES; DISCOVERY; FRAMEWORK

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标题: Integration of convolutional neural network and conventional machine learning classifiers for landslide susceptibility mapping

作者: Fang, ZC (Fang, Zhice); Wang, Y (Wang, Yi); Peng, L (Peng, Ling); Hong, HY (Hong, Haoyuan)

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摘要: Landslides are regarded as one of the most common geological hazards in a wide range of geo-environment. The aim of this study is to assess landslide susceptibility by integrating convolutional neural network (CNN) with three conventional machine learning classifiers of support vector machine (SVM), random forest (RF) and logistic regression (LR) in the case of Yongxin Country, China. To this end, 16 predisposing factors were first selected for landslide modelling. Then, a total of 364 landslide historical locations were randomly divided into training (70%; 255) and verification (30%; 109) sets for modelling process and assessment. Next, the training set was used for building three hybrid methods of CNN-SVM, CNN-RF and CNN-LR. In the following, the trained models were used for landslide susceptibility mapping. Finally, several objective measures were employed to compare and validate the performance of these methods. The experimental results demonstrated that the performance of the machine learning classifiers previously mentioned can be effectively improved by integrating the CNN technique. Therefore, the proposed hybrid methods can be recommended for landslide spatial modelling in other prone areas with similar geo-environmental conditions.

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语言: English

文献类型: Article

作者关键词: Landslide susceptibility mapping; Convolutional neural network; Feature extraction; Hybrid methods; Machine learning classifiers; Predisposing factors

KeyWords Plus: LOGISTIC-REGRESSION; HIMALAYAN AREA; RIVER-BASIN; MODELS; PREDICTION; ENSEMBLES; HIGHWAY; FOREST; COUNTY

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标题: Topological polaritons and photonic magic angles in twisted alpha-MoO(3)bilayers

作者: Hu, GW (Hu, Guangwei); Ou, QD (Ou, Qingdong); Si, GY (Si, Guangyuan); Wu, YJ (Wu, Yingjie); Wu, J (Wu, Jing); Dai, ZG (Dai, Zhigao); Krasnok, A (Krasnok, Alex); Mazor, Y (Mazor, Yarden); Zhang, Q (Zhang, Qing); Bao, QL (Bao, Qiaoliang); Qiu, CW (Qiu, Cheng-Wei); Alu, A (Alu, Andrea)

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摘要: Twisted two-dimensional bilayer materials exhibit many exotic electronic phenomena. Manipulating the 'twist angle' between the two layers enables fine control of the electronic band structure, resulting in magic-angle flat-band superconductivity(1,2), the formation of moire excitons(3-8)and interlayer magnetism(9). However, there are limited demonstrations of such concepts for photons. Here we show how analogous principles, combined with extreme anisotropy, enable control and manipulation of the photonic dispersion of phonon polaritons in van der Waals bilayers. We experimentally observe tunable topological transitions from open (hyperbolic) to closed (elliptical) dispersion contours in bilayers of alpha-phase molybdenum trioxide (alpha-MoO3), arising when the rotation between the layers is at a photonic magic twist angle. These transitions are induced by polariton hybridization and are controlled by a topological quantity. At the transitions the bilayer dispersion flattens, exhibiting low-loss tunable polariton canalization and diffractionless propagation with a resolution of less than lambda(0)/40, where lambda(0)is the free-space wavelength. Our findings extend twistronics(10)and moire physics to nanophotonics and polaritonics, with potential applications in nanoimaging, nanoscale light propagation, energy transfer and quantum physics.

The photonic dispersion of phonon polaritons in bilayers of alpha-phase molybdenum trioxide can undergo tunable topological transitions at magic interlayer twist angles.

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标题: Heterogeneous potassium isotopic composition of the upper continental crust

作者: Huang, TY (Huang, Tian-Yi); Teng, FZ (Teng, Fang-Zhen); Rudnick, RL (Rudnick, Roberta L.); Chen, XY (Chen, Xin-Yang); Hu, Y (Hu, Yan); Liu, YS (Liu, Yong-Sheng); Wu, FY (Wu, Fu-Yuan)

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摘要: Assessing the K isotopic composition of the upper continental crust is important for understanding the processes by which the crust is generated and modified, and constraining the K isotopic budget of the silicate Earth. High-precision K isotopic data are reported for 70 well-characterized individual and composite samples from the upper continental crust, including diorite, granodiorite, granite, loess, shale, graywacke, pelite, and tillite, to constrain its K isotopic composition. delta K-41 varies significantly in eight I-type and two S-type granites from Australia (-0.57 to -0.40 parts per thousand), nine A-type granites (-0.53 to -0.38 parts per thousand), and three granitoid composites including diorite, granodiorite, and granite (-0.50 to -0.37 parts per thousand) from China, mainly reflecting source heterogeneity. The 22 post-Archean Australian shales (PAAS) (delta K-41 = -0.68 to -0.12 parts per thousand) and the 12 sedimentary composites including graywacke, pelite, and tillite from China (delta K-41 = -0.57 to -0.23 parts per thousand) have heterogeneous K isotopic compositions while the 12 loess samples from around the world display more limited K isotopic variation (delta K-41 = -0.47 to -0.35 parts per thousand). delta K-41 values display a smaller dispersion in loess compared to shales, which have comparatively more intense weathering and higher chemical index of alteration (CIA). delta K-41 correlates with Fe2O3/Al2O3 and Fe2O3/K2O in shales and Al2O3/SiO2, K2O/Al2O3, and delta Li-7 in loess, suggesting that K isotopes are fractionated during chemical weathering. Overall, the upper continental crust has a heterogeneous K isotopic composition, ranging from -0.68 to -0.12 parts per thousand with an average delta K-41 of -0.44 +/- 0.05 parts per thousand (2SD, n = 88), which is indistinguishable from the mantle. (C) 2019 Elsevier Ltd. All rights reserved.

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标题: Ethylenediaminetetraacetic Acid (EDTA) Mitigates the Toxic Effect of Excessive Copper Concentrations on Growth, Gaseous Exchange and Chloroplast Ultrastructure of Corchorus capsularis L. and Improves Copper Accumulation Capabilities

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摘要: Copper (Cu) is an important micronutrient for a plant's normal growth and development. However, excess amount of Cu in the soil causes many severe problems in plants-which ultimately affect crop productivity and yield. Moreover, excess of Cu contents causes oxidative damage in the plant tissues by generating excess of reactive oxygen species (ROS). The present experiment was designed to investigate the phytoextraction potential of Cu, morpho-physiological features and biochemical reaction of jute (Corchorus capsularisL.) seedlings using ethylenediaminetetraacetic acid (EDTA) of 3 mM under different Cu levels (0 (control), 50 and 100 mu M) in a hydroponic nutrient solution (Hoagland). Our results showed that elevated Cu rates (50 and 100 mu M) in the nutrient solution significantly reduced plant height, fresh and dry biomass, total chlorophyll content and gaseous exchange attributes inC. capsularisseedlings. As the concentration of Cu in the medium increased (50 and 100 mu M), the level of malondialdehyde (MDA) and oxidative stress inC. capsularisseedlings also increased, which could have been controlled by antioxidant activity in particular plant cells. In addition, rising Cu concentration in the nutrient solution also increased Cu uptake and accumulation in roots and leaves as well as affected the ultrastructure of chloroplast ofC. capsularisseedlings. The addition of EDTA to the nutrient solution significantly alleviated Cu toxicity inC. capsularisseedlings, showing a significantly increase in plant growth and biomass. MDA contents was not significantly increased in EDTA-induced plants, suggesting that this treatment was helpful in capturing ROS and thereby reducing ROS in inC. capsularisseedlings. EDTA modification with Cu, although the bioaccumulation factor in roots and leaves and translocation factor for the leaves ofC. capsularisseedlings has significantly increased. These results indicate thatC. capsularishas considerable potential to cope with Cu stress and is capable of removing a large quantity of Cu from the Cu-contaminated soil while using EDTA is a useful strategy to increase plant growth and biomass with Cu absorption capabilities.

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作者关键词: fibrous crop; copper stress; chelating agent; phytoremediation; oxidative stress; ultrastructure of chloroplast

KeyWords Plus: INDUCED OXIDATIVE STRESS; ORYZA-SATIVA L.; BRASSICA-NAPUS; CITRIC-ACID; HEAVY-METALS; ANTIOXIDANT ENZYMES; ENHANCED PHYTOEXTRACTION; CADMIUM TOXICITY; SALICYLIC-ACID; PLANT-GROWTH

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标题: Biomimetic structural cellulose nanofiber aerogels with exceptional mechanical, flame-retardant and thermal-insulating properties

作者: Wang, D (Wang, Dong); Peng, HY (Peng, Hongyun); Yu, B (Yu, Bin); Zhou, KQ (Zhou, Keqing); Pan, HF (Pan, Haifeng); Zhang, LP (Zhang, Liping); Li, M (Li, Min); Liu, MM (Liu, Mingming); Tian, AL (Tian, Anli); Fu, SH (Fu, Shaohai)

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摘要: With the rapid increase of energy consumption, thermal-insulating materials made from abundant renewable resources are in urgent need for energy-efficient buildings, which satisfies the sustainable development of society. Cellulose nanofiber aerogels exhibit a promising prospect in thermal-insulating application, whereas still confront the inherent weakness of high flammability as well as the improvement of mechanical stiffness and thermal insulation. In the present study, inserting the growth of two-dimensional zirconium phosphate within multilayer graphene results in the formation of hierarchical graphene-confined zirconium phosphate (ZrP/RGO) nanosheets through a spatial confinement strategy. Inspired by the porous lamella-bridge architecture of Thalia dealbata stem, a unidirectional freeze-casing technique is utilized to assemble the building blocks of cellulose nanofiber and ZrP/RGO nanosheet into a biomimetic-structural aerogel which has excellent thermal-insulating, mechanical and flame-retardant properties. Compared with state-of-the-art cellulose nanofiber-based aerogels, the resulting composite aerogel perpendicular to lamellar alignments shows an ultralow thermal conductivity (18 mW.m(-1).K-1), the maximal specific Young's modulus (104 kN.m.kg(-1)) and high limited oxygen index (33.5) as well as very low peak heat release rate (14.1 kW/m(2)). Nature provides renewable resources and structural inspirations to achieve high-performance thermal insulation materials through nanoscale engineering.

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作者关键词: Cellulose nanofibers; Biomimetic-structural aerogels; Graphene-confined zirconium phosphate; Thermal insulation; Flame retardance; Mechanical properties

KeyWords Plus: REDUCING FIRE HAZARDS; MOLYBDENUM-DISULFIDE NANOSHEETS; OF-THE-ART; CARBON NANOTUBES; GRAPHENE; FOAMS; HYBRID; NANOCELLULOSE; CONSTRUCTION; FLAMMABILITY

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作者: Zeng, HB (Zeng, Hong-Bing); Zhai, ZL (Zhai, Zheng-Liang); He, Y (He, Yong); Teo, KL (Teo, Kok-Lay); Wang, W (Wang, Wei)

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摘要: This paper analyses the stability of sampled-data systems with time-delay. By employing a two-sided looped-functional approach, some improved conditions are derived to guarantee the stability of the system under consideration. Then, based the conditions, some intrinsic relationships between sampled-data period and time delay are obtained. From the illustrative example being solved by the proposed approach, it is observed that the results obtained are significantly better than those obtained by existing methods. More importantly, from the simulation being carried out, it is discovered that, contrary to the findings in previous studies, time-delays in a system may enlarge the interval of sampled-data periods and accelerate the rate of convergence of the system states, rather than deteriorate the system performance. (C) 2020 Elsevier Inc. All rights reserved.

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作者关键词: Stability; Sampled-data control; Time-delay; Looped-functional

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作者: Zhang, ZE (Zhang, Zhien); Pan, SY (Pan, Shu-Yuan); Li, H (Li, Hao); Cai, JC (Cai, Jianchao); Olabi, AG (Olabi, Abdul Ghani); Anthony, EJ (Anthony, Edward John); Manovic, V (Manovic, Vasilije)

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摘要: Carbon dioxide (CO2) is the major contributor to greenhouse gas (GHG) emissions and the main driver of climate change. Currently, CO2 utilization is increasingly attracting interest in processes like enhanced oil recovery and coal bed methane and it has the potential to be used in hydraulic fracturing processes, among others. In this review, the latest developments in CO2 capture, utilization, conversion, and sequestration are examined through a multi-scale perspective. The diverse range of CO2 utilization applications, including mineralization, biological utilization, food and beverages, energy storage media, and chemicals, is comprehensively presented. We also discuss the worldwide research and development of CO2 utilization projects. Lastly, we examine the key challenges and issues that must be faced for pilot-scale and industrial applications in the future. This study demonstrates that CO2 utilization can be a driver for the future development of carbon capture and utilization technologies. However, considering the amount of CO2 produced globally, even if it can be reduced in the near-to mid-term future, carbon capture and storage will remain the primary strategy and, so, complementary strategies are desirable. Currently, the main CO2 utilization industry is enhanced oil and gas recovery, but considering the carbon life cycle, these processes still add CO2 to the atmosphere. In order to implement other CO2 utilization technologies at a large scale, in addition to their current technical feasibility, their economic and societal viability is critical. Therefore, future efforts should be directed toward reduction of energy penalties and costs, and the introduction of policies and regulation encouraging carbon capture, utilization and storage, and increasing the public acceptance of the strategies in a complementary manner.

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标题: A re-assessment of elemental proxies for paleoredox analysis

作者: Algeo, TJ (Algeo, Thomas J.); Liu, JS (Liu, Jiangsi)

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摘要: Paleoredox conditions are commonly evaluated based on elemental proxies but, despite their frequency of use, most of these proxies have received little comparative evaluation or assessment of their range of applicability to paleomarine systems. Here, we evaluate 21 elemental proxies, including six proxies based on the C-S-Fe-P system (TOC, S, TOC/S, DOPT, Fe/Al, C-org/P), nine proxies based on trace-metal enrichment factors (Co-EF, Cr-EF, Cu-EF, Mo-EF, Ni-EF, Pb-EF, U-EF, V-EF, Zn-EF), and six additional proxies from Jones and Manning (1994) (U/Th, U-auth, V/Cr, Ni/Co, Ni/V, (Cu+Mo)/Zn), in 55 Phanerozoic marine formations. We used principal components analysis (PCA) to determine relationships among these 21 proxies in each formation and then sought to identify patterns across the full database. The first principal component (PC1) accounted for 40.1% of total dataset variance on average, with the highest median loadings on trace-metal enrichment factors (Ni-EF 0.82, Mo-EF 0.76, all nine >0.50). The next highest median loadings are on C-S-Fe-P proxies (TOC 0.58, DOPT 0.30, C-org/P 0.28), with bimetal proxies yielding uniformly lower loadings (Ni/Co 0.18, V/Cr 0.13). PCA of the factor loadings for the 55 study formations demonstrated associations among the 21 elemental proxies linked to specific sediment host phases: (1) an organic cluster associated with TOC, Mo, V, and Zn, (2) a uranium cluster associated with all U-based proxies, and (3) a sulfide cluster associated with S and Fe as well as the trace metals Co, Cu, Ni, and Pb (i.e., the major and typical minor constituents of diagenetic pyrite).

The findings of the present study have important ramifications for use of elemental proxies for paleoredox analysis. First, all of the proxies examined here are influenced by environmental redox conditions to some degree, although the degree of redox influence on any given proxy can vary considerably from one formation to the next. Second, sedimentary enrichment of most proxies depends on the presence of specific mineral and organic host phases, and evaluation of elemental redox proxy data requires an understanding of how elements are partitioned among those phases. Third, no single proxy is a universally reliable redox indicator, although some are more consistently useful than others-notably, TOC and trace-metal EFs. Fourth, because of this inherent variability in proxy response, adoption of redox proxy thresholds established in earlier published studies is discouraged. Instead, we recommend that future redox studies establish redox thresholds on a formation-specific basis through internal cross-calibration of multiple redox proxies.

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作者关键词: Trace metals; Molybdenum; Uranium; Total organic carbon; Enrichment factors; Principal components analysis

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标题: Deconstructing South China and consequences for reconstructing Nuna and Rodinia

作者: Cawood, PA (Cawood, Peter A.); Wang, W (Wang, Wei); Zhao, TY (Zhao, Tianyu); Xu, YJ (Xu, Yajun); Mulder, JA (Mulder, Jacob A.); Pisarevsky, SA (Pisarevsky, Sergei A.); Zhang, LM (Zhang, Limin); Gan, CS (Gan, Chengshi); He, HY (He, Huiying); Liu, HC (Liu, Huichuan); Qi, L (Qi, Liang); Wang, YJ (Wang, Yuejun); Yao, JL (Yao, Jinlong); Zhao, GC (Zhao, Guochun); Zhou, MF (Zhou, Mei-Fu); Zi, JW (Zi, Jian-Wei)

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摘要: Contrasting models for internal and external locations of South China within the Nuna and Rodinia supercontinents can be resolved when the current lithotectonic associations of Mesoproterozoic and older rocks units that constitute the craton are redefined into four lithotectonic domains: Kongling, Kunming-Hainan, Wuyi, and Coastal. The Kongling and Kunming-Hainan domains are characterized by isolated Archean to early Paleoproterozoic rock units and events and crop out in northern and southern South China, respectively. The Kunming-Hainan Domain is preserved in three spatially separated regions at Kunming (southwestern South China), along the Ailaoshan shear zone, and within Hainan Island. Both domains were affected by late Paleoproterozoic tectonothermal events, indicating their likely juxtaposition by this time to form the proto-Yangtze Block. Late Paleoproterozoic and Mesoproterozoic sedimentary and igneous rock units developed on the protoYangtze Block, especially in its southern portions, and help link the rock units that formed along the shear zone at Ailaoshan and on Hainan Island into a single, spatially unified unit prior to Paleozoic to Cenozoic structural disaggregation and translation. The Wuyi Domain consists of late Paleoproterozoic rock units within a NE-SW trending, fault-bounded block in eastern South China. The Coastal Domain lies east of the Wuyi domain and is inferred to constitute a structurally separate block. Basement to the domain is not exposed, but zircon Hf model ages from Mesozoic granites suggest Mesoproterozoic basement at depth.

The Archean to Paleoproterozoic tectonothermal record of the Kongling and Kunming-Hainan domains corresponds closely with that of NW Laurentia, suggesting all were linked, probably in association with assembly and subsequent partial fragmentation of the Nuna supercontinent. Furthermore, the age and character of Mesoproterozoic magmatism and detrital zircon signature of sedimentary rocks in the proto-Yangtze Block matches well with western Laurentia and eastern Australia-Antarctica. In particular, the detrital zircon signature of late Paleoproterozoic to early Mesoproterozoic sedimentary units in the block (e.g. Dongchuan Group) share a similar age spectrum with the Wernecke Supergroup of northwest Laurentia. This, together with similarities in the type and age of Fe-Cu mineralization in the domain with that in eastern Australia-Antarctica, especially northeast Australia, suggests a location adjacent to northwest Laurentia, southern Siberia, and northeast Australia within the Nuna supercontinent.

The timing and character of late Paleoproterozoic magmatic activity in the Wuyi domain along with age of detrital zircons in associated sedimentary rocks matches the record of northern India. During rifting between Australia-Antarctica and Laurentia in the late Mesoproterozoic, the proto-Yangtze Block remained linked to northeast Australia. During accretionary orogenesis in the early Neoproterozoic, the proto-Yangtze Block assembled with the Wuyi Domain along the northern margin of India. The Coastal domain likely accreted at this time forming the South China Craton. Displacement of the Hainan and Ailaoshan assemblages from southwest of the Kunming assemblage likely occurred in the Cenozoic with the activation of the Ailaoshan-Red River fault system but could have begun in the early to mid-Paleozoic based on evidence for tectonothermal events in the Hainan assemblage.

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标题: IN SITU DATING OF HYDROTHERMAL MONAZITE AND IMPLICATIONS FOR THE GEODYNAMIC CONTROLS ON ORE FORMATION IN THE JIAODONG GOLD PROVINCE, EASTERN CHINA

作者: Deng, J (Deng, Jun); Qiu, KF (Qiu, Kun-Feng); Wang, QF (Wang, Qing-Fei); Goldfarb, R (Goldfarb, Richard); Yang, LQ (Yang, Li-Qiang); Zi, JW (Zi, Jian-Wei); Geng, JZ (Geng, Jian-Zhen); Ma, Y (Ma, Yao)

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摘要: The Jiaodong gold province, the largest gold producer in China, formed in a setting dominated by a 30-m.y. episode of Izanagi plate rollback and widespread extension, concomitant with late Mesozoic craton destruction. This study presents new high precision in situ sensitive high-resolution ion microprobe (SHRIMP) U-Th-Pb and laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) U-Pb ages for hydrothermal monazite from the largest of the Jiaodong gold deposits, which were previously dated as indicating ore formation over a few tens of millions of years when applying sericite Ar-Ar, zircon U-Pb, and less robust analytical techniques. Our U-Pb dating on monazite from the Jiaojia and Linglong deposits in western Jiaodong yielded consistent ages at ca. 120 Ma. The new geochronologic results, coupled with recently reported in situ monazite dates from smaller deposits in western Jiaodong, reveal that the deposits that host most of the >= 4,000-t Au resource formed during a relatively brief period at ca. 120 Ma. In eastern Jiaodong, the much smaller resource may have formed about 5 m.y. later, recorded by 114.2 +/- 1.5 Ma gold mineralization at the Rushan deposit. The postsubduction opening of a slab gap at ca. 120 Ma is the most likely cause of the extensive gold mineralization in Jiaodong. The gap induced a local and rapid devolatilization of the hydrated mantle wedge at submelt temperatures. The transient event included release of a major volume of gold-transporting aqueous-carbonic fluid that was stored in the wedge into major NNE-trending structures in the overlying lithosphere.

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作者: Song, BW (Song, Bowen); Spicer, RA (Spicer, Robert A.); Zhang, KX (Zhang, Kexin); Ji, JL (Ji, Junliang); Farnsworth, A (Farnsworth, Alexander); Hughes, AC (Hughes, Alice C.); Yang, YB (Yang, Yibo); Han, F (Han, Fang); Xu, YD (Xu, Yadong); Spicer, T (Spicer, Teresa); Shen, TY (Shen, Tianyi); Lunt, DJ (Lunt, Daniel J.); Shi, GL (Shi, Gongle)

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摘要: The Paleogene environment of today's semi-arid and arid Central Asia is poorly quantified and knowledge of the paleoelevation of northern Tibet remains elusive, yet both are crucially important for understanding inter-relationships between growth of the Tibetan Plateau and Asian monsoon development. Here, we apply the Climate-Leaf Analysis Multivariate Program (CLAMP) and moist enthalpy method to the newly discovered early Oligocene (30.8 Ma) fossil leaves from the Qaidam Basin, to reconstruct quantitatively the paleoclimate and paleoelevation of this critical part of northern Tibet. We find the Qaidam Basin floor vegetation was likely at similar to 3.3 +/- 1.4 km in the early Oligocene, similar to that of the present basin floor but higher than the rising Himalaya at that time, and experienced a temperate, moderately wet climate. Near-freezing (1.4 +/- 3.5 degrees C) winters accompanied cool summers (similar to 23 +/- 2.9 degrees C). Annual precipitation likely exceeded 1000 mm (growing season precipitation of 1229 +/- 643 mm) with subdued (non-monsoonal) seasonality in which summers were drier than winters. This finding challenges geodynamic models that envisage a Miocene or later uplift of northern Tibet and progressive uplift from the south. (C) 2020 Elsevier B.V. All rights reserved.

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标题: Soil vanadium(V)-reducing related bacteria drive community response to vanadium pollution from a smelting plant over multiple gradients

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摘要: The mining and smelting of navajoite has resulted in a serious vanadium pollution in regional geological environments and significant influence on soil microorganisms. However, the core microbiome responsible for adjusting community response to vanadium pollution and the driving pattern have been kept unclear. In this study, a suite of surface and profile soil samples over multiple gradients were collected in four directions and distances of 10-2000 m from a vanadium smelting plant in Panzhihua, China. The indigenous microbial communities and vanadium(V)-reducing related bacteria (VRB) were profiled by 16S rRNA gene high-throughput sequencing technique. Five VRB were detected in the original collected soil samples including Bacillus, Geobacter, Clostridium, Pseudomonas and Comamonadaceae based on high-throughput sequencing data analysis, and their abundances were significantly related with the content of vanadium. Low vanadium concentration promoted the growth of VRB, while high vanadium concentration would inhibit VRB multiplication. The Gaussian equation could be used to quantitatively describe the nonlinear relationship between VRB and vanadium. Network analysis demonstrated that the microbial communities were significantly influenced by VRB assemblage, and 1.32-52.77% of microbes in the community showed a close association with VRB. A laboratory incubation experiment also confirmed the core role of VRB to drive community response to vanadium pressure.

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作者: Cui, JK (Cui, Junkui); Gao, PP (Gao, Panpan); Deng, Y (Deng, Yang)

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摘要: Advanced reduction processes (ARPs) have emerged as a promising method for destruction of persistent per- and polyfluoroalkyl substances (PFAS) in water due to the generation of short-lived and highly reductive hydrated electrons (e(aq)(-)). This study provides a critical review on the mechanisms and performance of reductive destruction of PFAS with e(aq)(-). Unique properties of e(aq)(-) and its generation in different ARP systems, particularly UV/sulfite and UV/iodide, are overviewed. Different degradation mechanisms of PFAS chemicals, such as perfluorooctanoic acid (PFOA), perfluorooctanesulfonate (PFOS), and others (e.g., short chain perfluorocarboxylic acids (PFCAs) and perfluorosulfonic acids (PFSAs), per- and polyfluoro dicarboxylic acids, and fluorotelomer carboxylic acids), are reviewed, discussed, and compared. The degradation pathways of these PFAS chemicals rely heavily upon their head groups. For specific PFAS types, fluoroalkyl chain lengths may also affect their reductive degradation patterns. Degradation and defluorination efficiencies of PFAS are considerably influenced by solution chemistry parameters and operating factors, such as pH, dose of chemical solute (i.e., sulfite or iodide) for e(aq)(-) photoproduction, dissolved oxygen, humic acid, nitrate, and temperature. Furthermore, implications of the state-of-the-art knowledge on practical PFAS control actions in water industries are discussed and the priority research needs are identified.

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作者: Zhuang, ZY (Zhuang, Zeyan); Dai, J (Dai, Jun); Yu, MX (Yu, Maoxing); Li, JQ (Li, Jianqing); Shen, C (Shen, Pjngchuan); Hu, R (Hu, Rong); Lou, XD (Lou, Xiaoding); Zhao, ZJ (Zhao, Zujin); Tang, B (Tang, Ben Zhong)

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摘要: Photodynamic therapy (PDT) is considered a pioneering and effective modality for cancer treatment, but it is still facing challenges of hypoxic tumors. Recently, Type I PDT, as an effective strategy to address this issue, has drawn considerable attention. Few reports are available on the capability for Type I reactive oxygen species (ROS) generation of purely organic photosensitizers (PSs). Herein, we report two new Type I PSs, alpha-TPA-PIO and beta-TPA-PIO, from phosphindole oxide-based isomers with efficient Type I ROS generation abilities. A detailed study on photophysical and photochemical mechanisms is conducted to shed light on the molecular design of PSs based on the Type I mechanism. The in vitro results demonstrate that these two PSs can selectively accumulate in a neutral lipid region, particularly in the endoplasmic reticulum (ER), of cells and efficiently induce ER-stress mediated apoptosis and autophagy in PDT. In vivo models indicate that beta-TPA-PIO successfully achieves remarkable tumor ablation. The ROS-based ER stress triggered by beta-TPA-PIO-mediated PDT has high potential as a precursor of the immunostimulatory effect for immunotherapy. This work presents a comprehensive protocol for Type I-based purely organic PSs and highlights the significance of considering the working mechanism in the design of PSs for the optimization of cancer treatment protocols.

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标题: Finding Multiple Roots of Nonlinear Equation Systems via a Repulsion-Based Adaptive Differential Evolution

作者: Gong, WY (Gong, Wenyin); Wang, Y (Wang, Yong); Cai, ZH (Cai, Zhihua); Wang, L (Wang, Ling)

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摘要: Finding multiple roots of nonlinear equation systems (NESs) in a single run is one of the most important challenges in numerical computation. We tackle this challenging task by combining the strengths of the repulsion technique, diversity preservation mechanism, and adaptive parameter control. First, the repulsion technique motivates the population to find new roots by repulsing the regions surrounding the previously found roots. However, to find as many roots as possible, algorithm designers need to address a key issue: how to maintain the diversity of the population. To this end, the diversity preservation mechanism is integrated into our approach, which consists of the neighborhood mutation and the crowding selection. In addition, we further improve the performance by incorporating the adaptive parameter control. The purpose is to enhance the search ability and remedy the trial-and-error tuning of the parameters of differential evolution (DE) for different problems. By assembling the above three aspects together, we propose a repulsion-based adaptive DE, called RADE, for finding multiple roots of NESs in a single run. To evaluate the performance of RADE, 30 NESs with diverse features are chosen from the literature as the test suite. Experimental results reveal that RADE is able to find multiple roots simultaneously in a single run on all the test problems. Moreover, RADE is capable of providing better results than the compared methods in terms of both root rate and success rate.

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KeyWords Plus: GLOBAL OPTIMIZATION; MULTIOBJECTIVE OPTIMIZATION; ALGORITHM; HOMOTOPY; SEEKING; SEARCH

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标题: Data-Driven Fault Diagnosis Method Based on Compressed Sensing and Improved Multiscale Network

作者: Hu, ZX (Hu, Zhong-Xu); Wang, Y (Wang, Yan); Ge, MF (Ge, Ming-Feng); Liu, J (Liu, Jie)

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摘要: The diagnosis of the key components of rotating machinery systems is essential for the production efficiency and quality of manufacturing processes. The performance of the traditional diagnosis method depends heavily on feature extraction, which relies on the degree of individuals expertise or prior knowledge. Recently, a deep learning (DL) method is applied to automate feature extraction. However, training in the DL method requires a massive amount of sensor data, which is time consuming and poses a challenge for its applications in engineering. In this paper, a new data-driven fault diagnosis method based on compressed sensing (CS) and improved multiscale network (IMSN) is proposed to recognize and classify the faults in rotating machinery. CS is used to reduce the amount of raw data, from which the fault information is discovered. At the same time, it can be used to generate sufficient training samples for the subsequent learning. The one-dimensional compressed signal is converted to two-dimensional image for further learning. An IMSN is established for learning and obtaining deep features. It improves the diagnosis performance of the DL process. The faults of the key components are identified from a softmax model. Experimental analysis is performed to verify effectiveness of the proposed data-driven fault diagnosis method.

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KeyWords Plus: CLASSIFICATION; MACHINERY

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作者: Wang, CY (Wang, Chunyi); Linderholm, HW (Linderholm, Hans W.); Song, YL (Song, Yanling); Wang, F (Wang, Fang); Liu, YJ (Liu, Yanju); Tian, JF (Tian, Jinfeng); Xu, JX (Xu, Jinxia); Song, YB (Song, Yingbo); Ren, GY (Ren, Guoyu)

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摘要: Climate change has a distinct impact on agriculture in China, particularly in the northeast, a key agriculture area sensitive to extreme hydroclimate events. Using monthly climate and agriculture data, the influence of drought on maize and soybean yields-two of the main crops in the region-in northeast China since 1961 to 2017 were investigated. The results showed that the temperature in the growing season increased by 1.0 degrees C from the period 1998-2017 to the period 1961-1980, while the annual precipitation decreased slightly. However, precipitation trends varied throughout the growing season (May-September), increasing slightly in May and June, but decreasing in July, August and September, associated with the weakening of the East Asian summer monsoon. Consequently, the annual and growing season drought frequency increased by 15%, and 25%, respectively, in the period 1998-2017 relative to the period 1961-1980. The highest drought frequency (55%) was observed in September. At the same time, the drought intensity during the growing season increased by 7.8%. The increasing frequency and intensity of drought had negative influences on the two crops. During moderate drought years in the period 1961-2017, 3.2% and 10.4% of the provincial maize and soybean yields were lost, respectively. However, during more severe drought years, losses doubled for soybean (21.8%), but increased more than four-fold for maize (14.0%). Moreover, in comparison to the period 1961-1980, a higher proportion of the yields were lost in the period 1998-2017, particularly for maize, which increased by 15% (increase for soybean was 2.4%). This change largely depends on increasing droughts in August and September, when both crops are in their filling stages. The impact of drought on maize and soybean production was different during different growth stages, where a strong relationship was noted between drought and yield loss of soybean in its filling stage. Given the sensitivity of maize and soybean yields in northeast China to drought, and the observed production trends, climate change will likely have significant negative impacts on productivity in the future.

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标题: Late Silurian-Early Devonian slab break-off beneath the Canadian Appalachians: Insights from the Nashwaak Granite, west-central New Brunswick, Canada

作者: Zhang, W (Zhang, Wei); Lentz, DR (Lentz, David R.); Thorne, KG (Thorne, Kathleen G.); Massawe, RJR (Massawe, Ronald J. R.)

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摘要: Late Silurian-Early Devonian granites are widespread in the Miramichi Highlands of New Brunswick, but their petrogenesis is controversial and hinders an understanding of the geological evolution of the Canadian Appalachians. Here we present a detailed geochemical and geochronological study of the Nashwaak Granite, and compare it with coeval granites in this region to indicate a Late Silurian-Early Devonian slab break-off regime in the Canadian Appalachians. The Nashwaak Granite consists of two-mica granite, biotite granite, and biotite granite dyke swarms. These rocks intruded at ca. 420 Ma and their compositions show a highly siliceous, calc-alkaline, and peraluminous characteristic. They show similar REE distribution patterns, similar depletion of Ba, Sr, Nb, P, and Ti, and similar Nd isotopes as contemporaneous granites inboard of the Salinic suture zone (Bamford Brook Fault). Together, these data suggest that Late Silurian-Early Devonian granites in theMiramichi Highlands may be derived from partial melting of the Neoproterozoic to lower Cambrian Ganderian basement resembling the Brookville terrane. Enriched subcontinental lithospheric mantle may have also been involved in the magma system (where coeval gabbro occurs within the Granite), but a contribution from asthenospheric mantle is absent. These linearly-distributed and post-collisional granites are most likely formed by Salinic slab break-off, with corresponding uplift and extension recorded by 422-419 Ma bimodal volcanic rocks, unconformities in sedimentary rocks, and extensional deformation (D3) in the Brunswick subduction complex of northern New Brunswick. (C) 2020 Elsevier B.V. All rights reserved.

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作者关键词: Nashwaak Granite; Geochemistry; Sr-Nd isotopes; Salinic orogenesis; Slab break-off

KeyWords Plus: SOUTHWESTERN NEW-BRUNSWICK; NORTHERN NEW-BRUNSWICK; I-TYPE; GEOCHEMICAL CHARACTERISTICS; NEWFOUNDLAND APPALACHIANS; PERALUMINOUS GRANITES; TECTONIC SIGNIFICANCE; CRUSTAL STRUCTURE; VOLCANIC-ROCKS; MAGMATISM

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作者: Dai, J (Dai, Jun); Wu, X (Wu, Xia); Ding, SY (Ding, Siyang); Lou, XD (Lou, Xiaoding); Xia, F (Xia, Fan); Wang, SX (Wang, Shixuan); Hong, YN (Hong, Yuning)

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摘要: Photodynamic therapy (PDT) has emerged as a promising noninvasive treatment option for cancers and other diseases. The key factor that determines the effectiveness of PDT is the photosensitizers (PSs). Upon light irradiation, the PSs would be activated, produce reactive oxygen species (ROS), and induce cell death. One of the challenges is that traditional PSs adopt a large flat disc-like structure, which tend to interact with the adjacent molecules through strong p-p stacking that reduces their ROS generation ability. Aggregation-induced emission (AIE) molecules with a twisted configuration to suppress strong intermolecular interactions represent a new class of PSs for image-guided PDT. In this Miniperspective, we summarize the recent progress on the design rationale of AIE-PSs and the strategies to achieve desirable theranostic applications in cancers. Subsequently, approaches of combining AIE-PS with other imaging and treatment modalities, challenges, and future directions are addressed.

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标题: Robust and Stable Acidic Overall Water Splitting on Ir Single Atoms

作者: Luo, F (Luo, Fang); Hu, H (Hu, Hao); Zhao, X (Zhao, Xiao); Yang, ZH (Yang, Zehui); Zhang, Q (Zhang, Quan); Xu, JX (Xu, Jingxiang); Kaneko, T (Kaneko, Takuma); Yoshida, Y (Yoshida, Yusuke); Zhu, CZ (Zhu, Chengzhou); Cai, WW (Cai, Weiwei)

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摘要: Single-atom electrocatalysts (SAEs) can realize the target of low-cost by maximum atomic efficiency. However, they usually suffer performance decay due to high energy states, especially in a harsh acidic water splitting environment. Here, we conceive and realize a double protecting strategy that ensures robust acidic water splitting on Ir SAEs by dispersing Ir atoms in/onto Fe nanoparticles and embedding IrFe nanoparticles into nitrogen-doped carbon nanotubes (Ir-SA@Fe@NCNT). When Ir-SA@Fe@NCNT acts as a bifunctional electrocatalyst at ultralow Ir loading of 1.14 mu g cm(-2), the required overpotentials to deliver 10 mA cm(-2) are 250 and 26 mV for oxygen evolution reaction (OER) and hydrogen evolution reaction (HER) in 0.5 M H2SO4 electrolyte corresponding to 1370- and 61-fold better mass activities than benchmark IrO, and Pt/C at an overpotential of 270 mV, respectively, resulting in only 1.51 V to drive overall water splitting. Moreover, remarkable stability is also observed compared to Pt/C-IrO2.

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作者关键词: Acidic water splitting; Iridium single atom; Oxygen evolution reaction; Hydrogen evolution reaction

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标题: Deep high-temperature hydrothermal circulation in a detachment faulting system on the ultra-slow spreading ridge

作者: Tao, CH (Tao, Chunhui); Seyfried, WE (Seyfried, W. E., Jr.); Lowell, RP (Lowell, R. P.); Liu, YL (Liu, Yunlong); Liang, J (Liang, Jin); Guo, ZK (Guo, Zhikui); Ding, K (Ding, Kang); Zhang, HT (Zhang, Huatian); Liu, J (Liu, Jia); Qiu, L (Qiu, Lei); Egorov, I (Egorov, Igor); Liao, SL (Liao, Shili); Zhao, MH (Zhao, Minghui); Zhou, JP (Zhou, Jianping); Deng, XM (Deng, Xianming); Li, HM (Li, Huaiming); Wang, HC (Wang, Hanchuang); Cai, W (Cai, Wei); Zhang, GY (Zhang, Guoyin); Zhou, HW (Zhou, Hongwei); Lin, J (Lin, Jian); Li, W (Li, Wei)

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摘要: Coupled magmatic and tectonic activity plays an important role in high-temperature hydrothermal circulation at mid-ocean ridges. The circulation patterns for such systems have been elucidated by microearthquakes and geochemical data over a broad spectrum of spreading rates, but such data have not been generally available for ultra-slow spreading ridges. Here we report new geophysical and fluid geochemical data for high-temperature active hydrothermal venting at Dragon Horn area (49.7 degrees E) on the Southwest Indian Ridge. Twin detachment faults penetrating to the depth of 13 +/- 2 km below the seafloor were identified based on the microearthquakes. The geochemical composition of the hydrothermal fluids suggests a long reaction path involving both mafic and ultramafic lithologies. Combined with numerical simulations, our results demonstrate that these hydrothermal fluids could circulate similar to 6 km deeper than the Moho boundary and to much greater depths than those at Trans-Atlantic Geotraverse and Logachev-1 hydrothermal fields on the Mid-Atlantic Ridge.

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标题: BS-Nets: An End-to-End Framework for Band Selection of Hyperspectral Image

作者: Cai, YM (Cai, Yaoming); Liu, XB (Liu, Xiaobo); Cai, ZH (Cai, Zhihua)

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摘要: Hyperspectral image (HSI) consists of hundreds of continuous narrowbands with high spectral correlation, which would lead to the so-called Hughes phenomenon and the high computational cost in processing. Band selection (BS) has been proven to be effective in avoiding such problems by removing redundant bands. However, many existing BS methods separately estimate the significance for every single band and cannot fully consider the nonlinear and global interaction between spectral bands. In this article, by assuming that a complete HSI band set can be reconstructed from its few informative bands, we propose a unified BS framework, BS Network (BS-Net). The framework consists of a band attention module (BAM), which aims to explicitly model the nonlinear interdependences between spectral bands, and a reconstruction network (RecNet), which is used to restore the original HSI from the learned informative bands, resulting in a flexible architecture. The resulting framework is end-to-end trainable, making it easier to train from scratch and to combine with many existing networks. We implement two versions of BS-Nets, respectively, using fully connected networks (BS-Net-FC) and convolutional neural networks (BS-Net-Conv), and extensively compare their results with popular existing BS approaches on three real hyperspectral data sets, showing that the proposed BS-Nets can accurately select informative band subset with less redundancy and outperform the competitors in terms of classification accuracy with competitive time cost.

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作者关键词: Hyperspectral imaging; Image reconstruction; Neural networks; Geology; Feature extraction; Task analysis; Attention mechanism; band selection (BS); deep neural networks (DNNs); hyperspectral image (HSI); spectral reconstruction

KeyWords Plus: MULTIOBJECTIVE OPTIMIZATION; HIGH INFORMATION; NETWORK; CLASSIFICATION; POLLUTION

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标题: Ecological disturbance in tropical peatlands prior to marine Permian-Triassic mass extinction

作者: Chu, DL (Chu, Daoliang); Grasby, SE (Grasby, Stephen E.); Song, HJ (Song, Haijun); Dal Corso, J (Dal Corso, Jacopo); Wang, Y (Wang, Yao); Mather, TA (Mather, Tamsin A.); Wu, YY (Wu, Yuyang); Song, HY (Song, Huyue); Shu, WC (Shu, Wenchao); Tong, JN (Tong, Jinnan); Wignall, PB (Wignall, Paul B.)

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摘要: The Permian-Triassic mass extinction is widely attributed to the global environmental changes caused by the eruption of the Siberian Traps. However, the precise temporal link between marine and terrestrial crises and volcanism is unclear. Here, we report anomalously high mercury (Hg) concentrations in terrestrial strata from southwestern China, synchronous with Hg anomalies in the marine Permian-Triassic type section. The terrestrial sediments also record increased abundance of fossil charcoal coincident with the onset of a negative carbon isotope excursion and the loss of tropical rainforest vegetation, both of which occurred immediately before the peak of Hg concentrations. The organic carbon isotope data show an similar to 5%,-6%, negative excursion in terrestrial organic matter (bulk organic, cuticles, and charcoal), reflecting change in atmospheric CO2 carbon-isotope composition coincident with enhanced wildfire indicated by increased charcoal. Hg spikes provide a correlative tool between terrestrial and marine records along with carbon isotope trends. These data demonstrate that ecological deterioration occurred in tropical peatlands prior to the main marine mass extinction.

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标题: Copper Uptake and Accumulation, Ultra-Structural Alteration, and Bast Fibre Yield and Quality of Fibrous Jute (Corchorus capsularis L.) Plants Grown under Two Different Soils of China

作者: Saleem, MH (Saleem, Muhammad Hamzah); Ali, S (Ali, Shafaqat); Irshad, S (Irshad, Sana); Hussaan, M (Hussaan, Muhammad); Rizwan, M (Rizwan, Muhammad); Rana, MS (Rana, Muhammad Shoaib); Hashem, A (Hashem, Abeer); Abd Allah, EF (Abd Allah, Elsayed Fathi); Ahmad, P (Ahmad, Parvaiz)

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摘要: Copper (Cu) is an essential heavy metal for plants, but high Cu concentration in the soil causes phytotoxicity. Some plants, however, possess a system that can overcome Cu toxicity, such as Cu localization, and an active antioxidant defence system to reduce oxidative damage induced by high Cu concentration. The present study was conducted to explore the phytoremediation potential, morpho-physiological traits, antioxidant capacity, and fibre quality of jute (Corchorus capsularis) grown in a mixture of Cu-contaminated soil and natural soil at ratios of 0:1 (control), 1:0, 1:1, 1:2 and 1:4. Our results showed that high Cu concentration in the soil decreased plant growth, plant biomass, chlorophyll content, gaseous exchange, and fibre yield while increasing reactive oxygen species (ROS), which indicated oxidative stress induced by high Cu concentration in the soil. Antioxidant enzymes, such as superoxidase dismutase (SOD), peroxidase (POD), catalase (CAT) and ascorbate peroxidase (APX) scavenge ROS in plant cells/tissues. Furthermore, high Cu concentration did not significantly worsen the fibre quality of C. capsularis, and this plant was able to accumulate a large amount of Cu, with higher Cu accumulation in its shoots than in its roots. Transmission electron microscopy (TEM) revealed that Cu toxicity affected different organelles of C. capsularis, with the chloroplast as the most affected organelle. On the basis of these results, we concluded that high Cu concentration was toxic to C. capsularis, reducing crop yield and plant productivity, but showing little effect on plant fibre yield. Hence, C. capsularis, as a fibrous crop, can accumulate a high concentration of Cu when grown in Cu-contaminated sites.

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作者关键词: Corchorus capsularis; copper contaminated soil; gaseous exchange attributes; phytoremediation; antioxidants

KeyWords Plus: INDUCED OXIDATIVE STRESS; CONTAMINATED SOILS; EXCESS COPPER; HEAVY-METALS; PHYTOEXTRACTION; PHYTOREMEDIATION; RESPONSES; SEEDLINGS; EDTA; CHLOROPLASTS

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标题: The Bastar craton, central India: A window to Archean - Paleoproterozoic crustal evolution

作者: Santosh, M (Santosh, M.); Tsunogae, T (Tsunogae, T.); Yang, CX (Yang, Cheng-Xue); Han, YS (Han, Yue-Sheng); Hari, KR (Hari, K. R.); Prasanth, MPM (Prasanth, M. P. Manu); Uthup, S (Uthup, Sam)

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摘要: The Bastar craton in central India, surrounded by cratonic blocks and Paleoproterozoic to Neoproterozoic orogenic belts, is a window to investigate the Archean-Paleoproterozoic crustal evolution and tectonic processes. Here we propose a new tectonic classification of the craton into the Western Bastar Craton (WBC), Eastern Bastar Craton (EBC), and the intervening Central Bastar Orogen (CBO). We present petrologic, geochemical and zircon U-Pb, REE and Lu-Hf data from a suite of rocks from the CBO and along the eastern margin of the WBC Including: (1) volcanic successions comprising meta-andesite and fine-grained amphibolite, representing arc-related volcanics along a convergent margin; (2) ferruginous sandstone, in association with rhyolite, representing a volcano-sedimentary succession, deposited in an active trench; and (3) metamorphosed mafic-ultramafic suite including gabbro, pyroxenite and dunite invaded by trondhjemite representing the section of sub-arc mantle and arc root adjacent to a long-lasting subduction system. Petrologic studies indicate that the mafic-ultramafic suite crystallized from an island arc tholeiitic parental magma in a suprasubduction zone environment. The chondrite-normalized and primitive mantle normalized diagrams of the mafic and ultramafic rocks suggest derivation from MORB magma. The mixed characters from N-MORB to E-MORB of the studied samples are consistent with subduction modification of a MORB related magma, involving partial melting of the metasomatized mantle wedge. Our zircon U-Pb age data suggest that the cratonic nuclei was constructed as early as Paleoarchean. We present evidence for active subduction and arc magmatism through Mesoarchean to Neoarchean and early Paleoproterozoic, with the trench remaining open until at least 2.3 Ga. Two major crust building events are recognized in the Bastar craton: during Mesoarchean (recycled Paleoarchean subduction-related as well as juvenile/depleted mantle components) and Neoarchean (accretion of juvenile oceanic crust, arc magmatism including granite batholiths and related porphyry mineralization). The final cratonization occurred during latest Paleoproterozoic, followed by collisional assembly of the craton and its incorporation within the Peninsular Indian mosaic during Mesoproterozoic. In the global supercontinent context, the craton preserves the history of Ur, the earliest supercontinent, followed by the Paleo-Mesoproterozoic Columbia, as well as minor thermal imprints of the Neoproterozoic Rodinia and associated Grenvillian orogeny. (c) 2019 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者关键词: Geochemistry; Zircon U-Pb geochronology and Lu-Hf isotopes; Crustal evolution; Tectonic implications; Bastar craton

KeyWords Plus: ZIRCON U-PB; HF ISOTOPE SYSTEMATICS; MAFIC DYKE SWARM; IN-SITU ANALYSIS; DHARWAR CRATON; CLINOPYROXENE COMPOSITION; SOUTHERN INDIA; VOLCANIC-ROCKS; CONTINENTAL GROWTH; DETRITAL ZIRCONS

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标题: Estimating aboveground biomass of the mangrove forests on northeast Hainan Island in China using an upscaling method from field plots, UAV-LiDAR data and Sentinel-2 imagery

作者: Wang, DZ (Wang, Dezhi); Wan, B (Wan, Bo); Liu, J (Liu, Jing); Su, YJ (Su, Yanjun); Guo, QH (Guo, Qinghua); Qiu, PH (Qiu, Penghua); Wu, XC (Wu, Xincai)

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摘要: The mangrove forests of northeast Hainan Island are the most species diverse forests in China and consist of the Dongzhai National Nature Reserve and the Qinglan Provincial Nature Reserve. The former reserve is the first Chinese national nature reserve for mangroves and the latter has the most abundant mangrove species in China. However, to date the aboveground ground biomass (AGB) of this mangrove region has not been quantified due to the high species diversity and the difficulty of extensive field sampling in mangrove habitat. Although three-dimensional point clouds can capture the forest vertical structure, their application to large areas is hindered by the logistics, costs and data volumes involved. To fill the gap and address this issue, this study proposed a novel upscaling method for mangrove AGB estimation using field plots, UAV-LiDAR strip data and Sentinel-2 imagery (named G similar to LiDAR similar to S2 model) based on a point-line-polygon framework. In this model, the partial-coverage UAV-LiDAR data were used as a linear bridge to link ground measurements to the wall-to-wall coverage Sentinel-2 data. The results showed that northeast Hainan Island has a total mangrove AGB of 312,806.29 Mg with a mean AGB of 119.26 Mg ha(-1). The results also indicated that at the regional scale, the proposed UAV-LiDAR linear bridge method (i.e., G similar to LiDAR similar to S2 model) performed better than the traditional approach, which directly relates field plots to Sentinel-2 data (named the G similar to S2 model) (R-2 = 0.62 > 0.52, RMSE = 50.36 Mg ha(-1) < 56.63 Mg ha(-1)). Through a trend extrapolation method, this study inferred that the G similar to LiDAR similar to S2 model could decrease the number of field samples required by approximately 37% in comparison with those required by the G similar to 52 model in the study area. Regarding the UAV-LiDAR sampling intensity, compared with the original number of LiDAR plots, 20% of original linear bridges could produce an acceptable accuracy (R-2 = 0.62, RMSE = 51.03 Mg ha(-1)). Consequently, this study presents the first investigation of AGE for the mangrove forests on northeast Hainan Island in China and verifies the feasibility of using this mangrove AGB upscaling method for diverse mangrove forests.

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语言: English

文献类型: Article

作者关键词: Mangroves; Aboveground biomass; UAV-LiDAR; Sentinel-2; Random forest

KeyWords Plus: OBJECT-BASED APPROACH; GROWING STOCK VOLUME; AIRBORNE LIDAR; ALLOMETRIC MODELS; SPECTRAL INDEXES; CANOPY COVER; CARBON STOCK; RED-EDGE; HEIGHT; LEAF

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标题: Integration of flexibility, cyclability and high-capacity into one electrode for sodium-ion hybrid capacitors with low self-discharge rate

作者: Wang, HW (Wang, Huanwen); Xu, DM (Xu, Dongming); Jia, GC (Jia, Guichong); Mao, ZF (Mao, Zhifei); Gong, YS (Gong, Yansheng); He, BB (He, Beibei); Wang, R (Wang, Rui); Fan, HJ (Fan, Hong Jin)

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摘要: Metal-ion hybrid capacitors are regarded as promising power sources for portable electronics because of numerous opportunities in designing the anode/cathode couple to realize high performance and device flexibility. Here we demonstrate our rational design of a porous-fiber network based electrode for quasi-solid-state flexible Na-ion hybrid capacitors. A SiO2-etching approach is deployed to synthesize the freestanding porous carbon nanofiber (PCNF) membrane that is both mechanically robust and light (similar to 1 mg cm(-2)). The PCNF serves as a 3D scaffold for the uniform growth of MoS2@poly(3,4-ethylenedioxythiophene) (PEDOT) core/shell nanosheets. The resultant PCNF@MoS2@PEDOT double core/shell nanofiber electrode not only maintains the intrinsic high-capacity of MoS2 for Na-ion storage, but also renders long-term cyclability and high rate performance. The constructed quasi-solid-state Na-ion hybrid capacitors can tolerate arbitrary bending and folding, and has a much lower self-discharge rate (15 mV h(-1)) compared to symmetric capacitors.

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文献类型: Article

作者关键词: Flexible energy storage; Mesoporous carbon fiber; MoS2; Sodium-ion hybrid capacitor; Self-discharge

KeyWords Plus: ENERGY-STORAGE; PERFORMANCE; SUPERCAPACITORS; NANOSHEETS; BATTERIES; LITHIUM; DESIGN; ARRAYS

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标题: Flood susceptibility mapping using convolutional neural network frameworks

作者: Wang, Y (Wang, Yi); Fang, ZC (Fang, Zhice); Hong, HY (Hong, Haoyuan); Peng, L (Peng, Ling)

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摘要: Flood is a very destructive natural disaster in the world, which seriously threatens the safety of human life and property. In this paper, the most popular convolutional neural network (CNN) is introduced to assess flood susceptibility in Shangyou County, China. The main contributions of this study are summarized as follows. First, the CNN technique is used for flood susceptibility mapping through two different CNN classification and feature extraction frameworks. Second, three data presentation methods are designed in the CNN architecture to fit the two proposed frameworks. To construct the proposed CNN-based methods, 13 flood triggering factors related to historical flood events in the study area were prepared. The performance of these CNN-based methods was evaluated using several objective criteria in comparison to the conventional support vector machine (SVM) classifier. Experiments results demonstrate that all the CNN-based methods can produce more reliable and practical flood susceptibility maps. For example, the proposed CNN-based classifiers were 0.022-0.054 higher than SVM in terms of area under the curve (AUC). In addition, in the classification process, CNN-based feature extraction can effectively improve the prediction capability of SVM by 0.021-0.051 in terms of AUC. Therefore, the proposed CNN frameworks can help mitigate and manage floods.

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语言: English

文献类型: Article

作者关键词: Flood susceptibility mapping; Convolution neural network; Classification; Feature extraction; China

KeyWords Plus: MULTICRITERIA DECISION-MAKING; FUZZY INFERENCE SYSTEM; ENSEMBLE; CLASSIFICATION; MODEL; PREDICTION; BASIN; AREA; BIVARIATE; ENTROPY

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标题: One-step synthesis of novel K+ and cyano groups decorated triazine-/heptazine-based g-C3N4 tubular homojunctions for boosting photocatalytic H-2 evolution

作者: Yang, J (Yang, Jian); Liang, YJ (Liang, Yujun); Li, K (Li, Kai); Yang, G (Yang, Gui); Wang, K (Wang, Kun); Xu, R (Xu, Rui); Xie, XJ (Xie, Xianjun)

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摘要: Constructing homojunctions with different morphologies, exposing facets, crystal phases or semiconductor types in a photocatalyst is an essential approach to boost the photoactivity. Herein, the g-C3N4 phase homojunctions decorated with cyano groups and K+ were designed and successfully synthesized via only adjusting the reaction temperatures within a facile one-step molten salt route. Such unique junctions were constructed through the overgrowth of triazine-based g-C3N4 nanoparticles embedded in the surface and inner wall of heptazine-based g-C3N4 hollow tubes. Benefited from the multiple advantages of high specific surface area, unique tubular structure, enhanced visible light absorption, and fast charge transfer and separation, the triazine-/heptazine-based g-C3N4 homojunctions drastically enhanced the photocatalytic hydrogen production performance, achieving a 2 and 12-fold improvement than the pristine g-C3N4 microtube and bulk g-C3N4, respectively. This study provides an in-depth insight into the design and fabrication of other g-C3N4 -based photocatalysts for more efficient solar energy conversion applications.

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语言: English

文献类型: Article

作者关键词: Heptazine-based g-C3N4; Triazine-based g-C3N4; Homojunctions; Molten salt synthesis; Photocatalytic hydrogen evolution

KeyWords Plus: GRAPHITIC CARBON NITRIDE; Z-SCHEME HETEROJUNCTION; MOLTEN-SALT SYNTHESIS; IN-SITU CONSTRUCTION; DOPED G-C3N4; CONTROLLABLE SYNTHESIS; MESOPOROUS G-C3N4; EFFICIENT; NANOTUBES; NANOSHEETS

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标题: Effects of heterogeneous technological progress on haze pollution: Evidence from China

作者: Yi, M (Yi, Ming); Wang, YQ (Wang, Yiqian); Sheng, MY (Sheng, Mingyue); Sharp, B (Sharp, Basil); Zhang, Y (Zhang, Yao)

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摘要: Technological progress plays an important role in combating haze pollution in the long run. However, existing studies often ignore the inconsistent effects on the reduction of haze brought by different types of technological progress. Considering the potential heterogeneity among technological progress, this paper constructs a theoretical framework to analyse the impact of heterogeneous technological progress on haze pollution, using annual data from 30 provinces and cities in China for the period of 2003 to 2016. A systematic GMM method is applied to empirically test the effects of neutral technological progress and biased technological progress on haze pollution. The results show that first, due to cost-reduction effect and income effect, neutral technological progress and labour-saving technological progress are conducive to haze reduction; while the impact of capital-saving technological progress on haze pollution is insignificant. Second, because of the energy rebound effect, energy-saving technological progress cannot effectively reduce haze pollution. Third, the haze-reduction effects of different types of technological progress show significant regional heterogeneity in China. Last, in terms of the control variables, strengthening environmental regulation is the only factor that can be helpful in haze reduction, others intensify haze pollution.

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语言: English

文献类型: Article

作者关键词: Neutral technological progress; Biased technological progress; PM2.5 concentration; Regional heterogeneity characteristics

KeyWords Plus: ENVIRONMENTAL KUZNETS CURVE; ECONOMIC-GROWTH; REGIONAL DIFFERENCES; ENERGY EFFICIENCY; PM2.5 POLLUTION; AIR-POLLUTION; CO2 EMISSIONS; PANEL-DATA; INNOVATION; IMPACT

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标题: Stock price prediction based on deep neural networks

作者: Yu, PF (Yu, Pengfei); Yan, XS (Yan, Xuesong)

来源出版物: NEURAL COMPUTING & APPLICATIONS 卷: 32 期: 6 特刊: SI 页: 1609-1628 DOI: 10.1007/s00521-019-04212-x 出版年: MAR 2020

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摘要: Understanding the pattern of financial activities and predicting their development and changes are research hotspots in academic and financial circles. Because financial data contain complex, incomplete and fuzzy information, predicting their development trends is an extremely difficult challenge. Fluctuations in financial data depend on a myriad of correlated constantly changing factors. Therefore, predicting and analysing financial data are a nonlinear, time-dependent problem. Deep neural networks (DNNs) combine the advantages of deep learning (DL) and neural networks and can be used to solve nonlinear problems more satisfactorily compared to conventional machine learning algorithms. In this paper, financial product price data are treated as a one-dimensional series generated by the projection of a chaotic system composed of multiple factors into the time dimension, and the price series is reconstructed using the time series phase-space reconstruction (PSR) method. A DNN-based prediction model is designed based on the PSR method and a long- and short-term memory networks (LSTMs) for DL and used to predict stock prices. The proposed and some other prediction models are used to predict multiple stock indices for different periods. A comparison of the results shows that the proposed prediction model has higher prediction accuracy.

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文献类型: Article

作者关键词: Financial data prediction; Neural networks; Deep learning; Phase-space reconstruction

KeyWords Plus: TIME-SERIES

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输出日期: 2022-01-19

标题: A relaxed quadratic function negative-determination lemma and its application to time-delay systems

作者: Zhang, CK (Zhang, Chuan-Ke); Long, F (Long, Fei); He, Y (He, Yong); Yao, W (Yao, Wei); Jiang, L (Jiang, Lin); Wu, M (Wu, Min)

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摘要: The quadratic function with respect to the time-varying delay has often been introduced for the analysis of systems with time-varying delays. To determine the negative definiteness of such function, this paper develops a parameter-adjustable-based lemma, which contains the lemma popularly used in literature as a special case and has potential to reduce the conservatism without requiring extra decision variables. A stability criterion for a linear time-delay system is established by using the proposed lemma, whose advantage is demonstrated via a numerical example, and the criterion is finally applied to analyze the stability of load frequency control scheme for a single-area power system. (C) 2019 Elsevier Ltd. All rights reserved.

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作者关键词: Time-delay system; Time-varying delay; a relaxed quadratic function lemma; Stability

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标题: Analysis of Lower Cambrian shale gas composition, source and accumulation pattern in different tectonic backgrounds: A case study of Weiyuan Block in the Upper Yangtze region and Xiuwu Basin in the Lower Yangtze region

作者: Zhang, K (Zhang, Kun); Jia, CZ (Jia, Chengzao); Song, Y (Song, Yan); Jiang, S (Jiang, Shu); Jiang, ZX (Jiang, Zhenxue); Wen, M (Wen, Ming); Huang, YZ (Huang, Yizhou); Liu, XX (Liu, Xiaoxue); Jiang, T (Jiang, Tao); Peng, J (Peng, Jun); Wang, X (Wang, Xin); Xia, QS (Xia, Qingsong); Li, B (Li, Bin); Li, X (Li, Xin); Liu, TL (Liu, Tianlin)

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摘要: Marine shale gas exploration in southern China has successes and failures. Under the condition of great hydrocarbon generation material basis, shale gas wells drilled from some shale gas blocks are rich in methane, while the wells in other shale gas blocks with high nitrogen and low hydrocarbon gas, which indicates that they have different accumulation mechanisms. Therefore, the study of gas composition in shale will help us to figure out the mechanism of shale gas accumulation and loss. In this paper, the Lower Cambrian shale from Wei-201 well in Upper Yangtze Weiyuan Block and Jiangye-1 well from Lower Yangtze Xiuwu Basin are selected as research object, and shale samples are used for tests and experiments including analysis of gas composition and nitrogen isotope, test of porosity and TOC content, overburden permeability test, permeability test before and after methane adsorption under different osmotic pressure, permeability test parallel and vertical to the bedding surface, FIB-SEM (Focus Ion Beam Scanning Electron Microscope) and FIB-HIM (Focused Ion Beam Helium Ion Microscope). Finally, the reasons for the difference in the gas components of the Lower Cambrian shale gas in Weiyuan Block and Xiuwu Basin are studied by means of seismic interpretation, core description and outcrop observation besides the tests and experiments. The results show that the gas components of the Lower Cambrian shale in Weiyuan Block, the Upper Yangtze, mainly consist of methane, derived from liquid hydrocarbon cracking. The sealing capacity of roof and floor, the great self-sealing of shale and the flat anticline structure contribute to the high methane content in shale gas. The Lower Cambrian shale gas in Xiuwu Basin, the Lower Yangtze, is mostly nitrogen, which is derived both from atmosphere and deep crust-upper mantle. The detachment layer at the bottom of the Lower Cambrian, the widely developed deep faults and the Jurassic volcanic activity are the reasons for the high nitrogen and low hydrocarbon of shale gas. Based on the above analysis, the patterns are summarized for shale gas accumulation in the simple anticline background and reservoir destruction in the complex syncline background.

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语言: English

文献类型: Article

作者关键词: Carbon isotopes; Nitrogen isotopes; Sealing property; Parallel bedding migration; Detachment layer; Deep fault; Volcanic activity

KeyWords Plus: SOUTH CHINA EVIDENCE; SICHUAN BASIN; ORGANIC-MATTER; MARINE SHALE; ARGILLACEOUS DOLOMITE; HYDROTHERMAL ACTIVITY; QIONGZHUSI FORMATION; LONGMAXI FORMATION; GEOLOGICAL FACTORS; PORE STRUCTURE

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标题: Mesozoic Orogenic Gold Mineralization in the Jiaodong Peninsula, China: A Focused Event at 120 +/- 2 Ma During Cooling of Pregold Granite Intrusions

作者: Zhang, L (Zhang, Liang); Weinberg, RF (Weinberg, Roberto F.); Yang, LQ (Yang, Li-Qiang); Groves, DI (Groves, David, I); Sai, SX (Sai, Sheng-Xun); Matchan, E (Matchan, Erin); Phillips, D (Phillips, David); Kohn, BP (Kohn, Barry P.); Miggins, DP (Miggins, Daniel P.); Liu, Y (Liu, Yue); Deng, J (Deng, Jun)

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摘要: Jiaodong gold deposits are mainly sited along faulted contacts between Upper Jurassic Linglong granite and Precambrian basement metamorphic rocks or Lower Cretaceous Guojialing granite. Long-standing controversies relate to timing of gold mineralization and granite-gold relationships. In this study, gold-related muscovite consistently provides concordant Ar-40/Ar-39 plateau ages of 120 +/- 2 Ma (2 sigma) for the Jiaojia, Sizhuang, and Luoshan deposits. Analogous Ar-40/Ar-39 timing constraints from gold-related muscovite are provided by total gas and high-temperature ages from Fushun, concordant high-temperature ages from Rushan, and fusion-step ages from Xiadian deposits. These new Ar-40/Ar-39 ages, when combined with previous reliable Ar-40/Ar-39 and U-Pb age constraints for mineralization, including ages of pre- and postgold dikes, define a widespread gold mineralization event at 120 +/- 2 Ma (2 sigma). Published zircon U-Pb ages for Guojialing and Aishan granite magmatism suggest an similar to 8-m.y. lag between peak intrusive activity and gold mineralization. This, together with lack of both high-temperature alteration assemblages and alteration and/or metal zonation, indicates that the structurally controlled Jiaodong deposits are orogenic rather than intrusion-related deposits. Despite this, granite intrusions are considered to have provided suitable fluid trap sites. New Ar-40/Ar-39 analyses of biotite from the Linglong and Guojialing granites show they had cooled to about similar to 300 degrees +/- 50 degrees C by ca. 123 to 124 Ma, providing pressuretemperature conditions similar to those under which most orogenic gold deposits formed close to the ductilebrittle transition. This enabled the effective ingress of fluids at supralithostatic pressures at 120 +/- 2 Ma, leading to intensive brecciation, alteration, and deposition of both vein-type and disseminated gold ores. New zircon (U-Th)/He dates together with apatite fission-track data indicate that preservation of the gold province is due to slow postmineralization uplift and exhumation.

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标题: Enhanced piezoelectric-effect-assisted photoelectrochemical performance in ZnO modified with dual cocatalysts

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摘要: Promising strategies are of great significance for designing photoelectrodes with high charge separation efficiency and low charge recombination rate in photoelectrochemical (PEC) water splitting. In this paper, we firstly propose a method of combining piezoelectric effect with photoelectrochemical cell by utilizing of direct band gap metal-oxide semiconductor ZnO as the photoanode. After introducing piezoelectric effect resulted from ultrasonic vibrations, the current density value reaches 0.45 mA.cm(-2) at 1.23 V-RHE by the production of strain-induced charge and the enhancement of the electric field, 1.7 times higher than that of ZnO without ultrasonic vibrations (0.27 mA.cm(-2) at 1.23 V-RHE). The deposition of spatially separated dual cocatalysts, of which the bottom Pt act as electron collection and transport layer while the outmost Co-Pi serve as hole-transfer layer, further facilitates the separation of charge (strain-induced and photogenerated) and accelerates the reaction kinetics. The utilization of dual cocatalysts efficiently improves the performance of photoanodes and leads to a current density of 0.80 mA.cm(-2) at 1.23 V-RHE, 1.8 and 3.0 times higher than the values of ZnO with and without ultrasonic vibrations. The strategy provides a promising method and idea for the manufacture of practical and high-performance electrodes.

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语言: English

文献类型: Article

作者关键词: ZnO; Photoanode; Piezoelectric effect; Dual cocatalysts; Photoelectrochemical water splitting

KeyWords Plus: SURFACE MODIFICATION; INVERSE OPALS; ZINC-OXIDE; WATER; HETEROJUNCTION; SHELL; PHOTOANODES; ARRAYS; ABSORPTION; DEPOSITION

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输出日期: 2022-01-19

标题: The Traj2Vec model to quantify residents' spatial trajectories and estimate the proportions of urban land-use types

作者: Zhang, JB (Zhang, Jinbao); Li, X (Li, Xia); Yao, Y (Yao, Yao); Hong, Y (Hong, Ye); He, JY (He, Jialyu); Jiang, ZW (Jiang, Zhangwei); Sun, JC (Sun, Jianchao)

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摘要: The formulation of mixed urban land uses is not only intended to find the ideal scenario of land use but also regarded as a way toward sustainable urban development. We propose a geo-semantic mining approach Traj2Vec to quantify the trajectories of residents as high-dimensional semantic vectors. Then, a random forest (RF) method is used to model the relationship between the semantic vectors and mixed urban land uses. The proposed Traj2Vec approach can obtain the highest accuracy (OA = 0.7733, kappa = 0.7245) in urban land-use classification and a high average proportion accuracy (64.0%) in capturing the proportions of urban land-use types. Diversity analysis indicates that Shenzhen has a high degree of mixed urban land use at the scale of a street block. By analyzing the mixing index and the travel distance, we find a weak but significant negative correlation between them (), which not only confirms the conclusion that an increase in the degree of mixing will reduce the travel distances of residents but also verifies the mixing index. This suggests that urban planning should focus on mixed urban land uses, which can reduce the travel distances of residents, reduce energy consumption, and make cities more compact.

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文献类型: Article

作者关键词: Mixed urban land-use patterns; mobile phone positioning data; residents' spatial trajectories; traj2vec; geo-semantic mining

KeyWords Plus: SOCIAL MEDIA DATA; MOBILE PHONE; SCENE CLASSIFICATION; POINTS; TIME; AREAS

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标题: Single-Virus Tracking: From Imaging Methodologies to Virological Applications

作者: Liu, SL (Liu, Shu-Lin); Wang, ZG (Wang, Zhi-Gang); Xie, HY (Xie, Hai-Yan); Liu, AA (Liu, An-An); Lamb, DC (Lamb, Don C.); Pang, DW (Pang, Dai-Wen)

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摘要: Uncovering the mechanisms of virus infection and assembly is crucial for preventing the spread of viruses and treating viral disease. The technique of single-virus tracking (SVT), also known as single-virus tracing, allows one to follow individual viruses at different parts of their life cycle and thereby provides dynamic insights into fundamental processes of viruses occurring in live cells. SVT is typically based on fluorescence imaging and reveals insights into previously unreported infection mechanisms. In this review article, we provide the readers a broad overview of the SVT technique. We first summarize recent advances in SVT, from the choice of fluorescent labels and labeling strategies to imaging implementation and analytical methodologies. We then describe representative applications in detail to elucidate how SVT serves as a valuable tool in virological research. Finally, we present our perspectives regarding the future possibilities and challenges of SVT.

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文献类型: Review

KeyWords Plus: GREEN FLUORESCENT PROTEIN; INTERNAL-REFLECTION FLUORESCENCE; LIGHT-SHEET MICROSCOPY; INFLUENZA-A VIRUS; CLATHRIN-MEDIATED ENDOCYTOSIS; MULTIFOCAL PLANE MICROSCOPY; SEMICONDUCTOR QUANTUM DOTS; WHEAT-GERM-AGGLUTININ; LIPOIC ACID LIGASE; REAL-TIME TRACKING

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标题: Macroscopic Spontaneous Polarization and Surface Oxygen Vacancies Collaboratively Boosting CO2 Photoreduction on BiOIO3 Single Crystals

作者: Chen, F (Chen, Fang); Ma, ZY (Ma, Zhaoyu); Ye, LQ (Ye, Liqun); Ma, TY (Ma, Tianyi); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe); Huang, HW (Huang, Hongwei)

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摘要: Prompt recombination of photogenerated electrons and holes in bulk and on the surface of photocatalysts harshly impedes the photocatalytic efficiency. However, the simultaneous manipulation of photocharges in the two locations is challenging. Herein, the synchronous promotion of bulk and surface separation of photoinduced charges for prominent CO2 photoreduction by coupling macroscopic spontaneous polarization and surface oxygen vacancies (OVs) of BiOIO3 single crystals is reported. The oriented growth of BiOIO3 single-crystal nanostrips along the [001] direction, ensuing substantial well-aligned IO3 polar units, renders a large enhancement for the macroscopic polarization electric field, which is capable of driving the rapid separation and migration of charges from bulk to surface. Meanwhile the introduction of surface OVs establishes a local electric field for charge migration to catalytic sites on the surface of BiOIO3 nanostrips. Highly polarized BiOIO3 nanostrips with ample OVs demonstrate outstanding CO2 reduction activity for CO production with a rate of 17.33 mu mol g(-1) h(-1) (approximately ten times enhancement) without any sacrificial agents or cocatalysts, being one of the best CO2 reduction photocatalysts in the gas-solid system reported so far. This work provides an integrated solution to governing charge movement behavior on the basis of collaborative polarization from bulk and surface.

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作者关键词: charge separation; CO2 reduction; macroscopic spontaneous polarization; photocatalysis; surface polarization

KeyWords Plus: PHOTOCATALYTIC REDUCTION; HYDROGEN-EVOLUTION; CHARGE SEPARATION; ENHANCEMENT

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标题: Biochar-supported nanoscale zero-valent iron as an efficient catalyst for organic degradation in groundwater

作者: Li, Z (Li, Zhe); Sun, YQ (Sun, Yuqing); Yang, Y (Yang, Yang); Han, YT (Han, Yitong); Wang, TS (Wang, Tongshuai); Chen, JW (Chen, Jiawei); Tsang, DCW (Tsang, Daniel C. W.)

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摘要: High-efficiency and cost-effective catalysts are critical to completely mineralization of organic contaminants for in-situ groundwater remediation via advanced oxidation processes (AOPs). The engineered biochar is a promising method for waste biomass utilization and sustainable remediation. This study engineers maize stalk (S)and maize cob (C)-derived biochars (i.e., SB300, SB600, CB300, and CB600, respectively) with oxygen-containing functional groups as a carbon-based support for nanoscale zero-valent iron (nZVI). Morphological and physiochemical characterization showed that nZVI could be impregnated within the framework of the synthesized Fe-CB600 composite, which exhibited the largest surface area, pore volume, iron loading capacity, and Fe-0 proportion. Superior degradation efficiency (100% removal in 20 min) of trichloroethylene (TCE, 0.1 mM) and fast pseudo-first-order kinetics (k(obs) =22.0 ( -1)) were achieved via peroxymonosulfate (PMS, 5 mM) activation by the Fe-CB600 (1 g L-1) under groundwater condition (bicarbonate buffer solution at pH = 8.2). Superoxide radical and singlet oxygen mediated by Fe-0 and oxygen-containing group (i.e., C=O) were demonstrated as the major reactive oxygen species (ROSs) responsible for TCE dechlorination. The effectiveness and mechanism of the Fe/C composites for rectifying organic-contaminated groundwater were depicted in this study.

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文献类型: Article

作者关键词: Biomass waste valorization; Engineered biochar; nZVI-carbon composites; Sustainable waste management; Reactive oxygen species; Sustainable/green remediation

KeyWords Plus: X-RAY PHOTOELECTRON; FRACTURING WASTE-WATER; CARBON NANOTUBES; OXIDATION; PEROXYMONOSULFATE; REMOVAL; ACTIVATION; COMPOSITES; GENERATION; MECHANISM

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标题: Landslide Susceptibility Prediction Based on Remote Sensing Images and GIS: Comparisons of Supervised and Unsupervised Machine Learning Models

作者: Chang, ZL (Chang, Zhilu); Du, Z (Du, Zhen); Zhang, F (Zhang, Fan); Huang, FM (Huang, Faming); Chen, JW (Chen, Jiawu); Li, WB (Li, Wenbin); Guo, ZZ (Guo, Zizheng)

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摘要: Landslide susceptibility prediction (LSP) has been widely and effectively implemented by machine learning (ML) models based on remote sensing (RS) images and Geographic Information System (GIS). However, comparisons of the applications of ML models for LSP from the perspectives of supervised machine learning (SML) and unsupervised machine learning (USML) have not been explored. Hence, this study aims to compare the LSP performance of these SML and USML models, thus further to explore the advantages and disadvantages of these ML models and to realize a more accurate and reliable LSP result. Two representative SML models (support vector machine (SVM) and CHi-squared Automatic Interaction Detection (CHAID)) and two representative USML models (K-means and Kohonen models) are respectively used to scientifically predict the landslide susceptibility indexes, and then these prediction results are discussed. Ningdu County with 446 recorded landslides obtained through field investigations is introduced as case study. A total of 12 conditioning factors are obtained through procession of Landsat TM 8 images and high-resolution aerial images, topographical and hydrological spatial analysis of Digital Elevation Modeling in GIS software, and government reports. The area value under the curve of receiver operating features (AUC) is applied for evaluating the prediction accuracy of SML models, and the frequency ratio (FR) accuracy is then introduced to compare the remarkable prediction performance differences between SML and USML models. Overall, the receiver operation curve (ROC) results show that the AUC of the SVM is 0.892 and is slightly greater than the AUC of the CHAID model (0.872). The FR accuracy results show that the SVM model has the highest accuracy for LSP (77.80%), followed by the CHAID model (74.50%), the Kohonen model (72.8%) and the K-means model (69.7%), which indicates that the SML models can reach considerably better prediction capability than the USML models. It can be concluded that selecting recorded landslides as prior knowledge to train and test the LSP models is the key reason for the higher prediction accuracy of the SML models, while the lack of a priori knowledge and target guidance is an important reason for the low LSP accuracy of the USML models. Nevertheless, the USML models can also be used to implement LSP due to their advantages of efficient modeling processes, dimensionality reduction and strong scalability.

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语言: English

文献类型: Article

作者关键词: landslide susceptibility prediction; supervised machine learning; unsupervised machine learning; remote sensing; Geographic Information System

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标题: A holistic model for the origin of orogenic gold deposits and its implications for exploration

作者: Groves, DI (Groves, David I.); Santosh, M (Santosh, M.); Deng, J (Deng, Jun); Wang, QF (Wang, Qingfei); Yang, LQ (Yang, Liqiang); Zhang, L (Zhang, Liang)

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摘要: The term orogenic gold deposits has been widely accepted, but there has been continuing debate on their genesis. Early syn-sedimentary or syn-volcanic models and hydrothermal meteoric-fluid models are now invalid. Magmatic-hydrothermal models fail because of the lack of consistent spatially associated granitic intrusions and inconsistent temporal relationships. The most plausible models involve metamorphic fluids, but the source of these fluids is equivocal. Intra-basin sources within deeper segments of the hosting supracrustal successions, the underlying continental crust, subducted oceanic lithosphere with its overlying sediment wedge, and metasomatized lithosphere are all potential sources. Several features of Precambrian orogenic gold deposits are inconsistent with derivation from a continental metamorphic-fluid source. These include the presence of hypozonal deposits in amphibolite-facies domains, their anomalous multiple sulfur isotopic compositions, and problems of derivation of gold-related elements from devolatilization of dominant basalts in the sequences. The Phanerozoic deposits are largely described as hosted in greenschist-facies domains, consistent with supracrustal devolatilization models. A notable exception is the Jiaodong gold deposits of China, where ca. 120-Ma gold deposits are hosted in Precambrian crust that was metamorphosed over 2000 million years prior to gold mineralization. Other deposits in China are comparable to those in the Massif Central and elsewhere in France, in that they are hosted in amphibolite-facies domains or clearly post-date regional metamorphic events imposed on hosting supracrustal sequences. If all orogenic gold deposits have a common genesis, the only realistic source of fluid and gold is from devolatilization of a subducted oceanic slab with its overlying gold-bearing sulfide-rich sedimentary package, or the associated metasomatized mantle wedge, with CO2 released during decarbonation and S- and ore-related elements released from transformation of pyrite to pyrrhotite at about 500 degrees C. Although this model satisfies all geological, geochronological, isotopic, and geochemical constraints, and is consistent with limited computer-based modeling of fluid release from subduction zones, the precise mechanisms of fluid flux are model-driven and remain uncertain. From an exploration viewpoint, the model re-emphasizes the ubiquitous occurrence of orogenic gold deposits in subduction-related orogenic belts and importance of continental-scale lithosphere-tapping fault and shear zones to focus large volumes of auriferous fluid. It confirms the importance of the consistent spacing between world-class deposits, broadly equivalent to the depth of the Moho, as derived from empirical observations.

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KeyWords Plus: ARCHEAN GREENSTONE BELTS; U-PB ZIRCON; YILGARN BLOCK; JIAODONG PENINSULA; MANTLE FLUIDS; NOVA-SCOTIA; REGIONAL METAMORPHISM; LITHOSPHERIC MANTLE; GRANULITE FORMATION; CHINA IMPLICATIONS

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标题: A new multi-stable fractional-order four-dimensional system with self-excited and hidden chaotic attractors: Dynamic analysis and adaptive synchronization using a novel fuzzy adaptive sliding mode control method

作者: Jahanshahi, H (Jahanshahi, Hadi); Yousefpour, A (Yousefpour, Amin); Munoz-Pacheco, JM (Munoz-Pacheco, Jesus M.); Moroz, I (Moroz, Irene); Wei, ZC (Wei, Zhouchao); Castillo, O (Castillo, Oscar)

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摘要: Four-dimensional chaotic systems are a very interesting topic for researchers, given their special features. This paper presents a novel fractional-order four-dimensional chaotic system with self-excited and hidden attractors, which includes only one constant term. The proposed system presents the phenomenon of multi-stability, which means that two or more different dynamics are generated from different initial conditions. It is one of few published works in the last five years belonging to the aforementioned category. Using Lyapunov exponents, the chaotic behavior of the dynamical system is characterized, and the sensitivity of the system to initial conditions is determined. Also, systematic studies of the hidden chaotic behavior in the proposed system are performed using phase portraits and bifurcation transition diagrams. Moreover, a design technique of a new fuzzy adaptive sliding mode control (FASMC) for synchronization of the fractional-order systems has been offered. This control technique combines an adaptive regulation scheme and a fuzzy logic controller with conventional sliding mode control for the synchronization of fractional-order systems. Applying Lyapunov stability theorem, the proposed control technique ensures that the master and slave chaotic systems are synchronized in the presence of dynamic uncertainties and external disturbances. The proposed control technique not only provides high performance in the presence of the dynamic uncertainties and external disturbances, but also avoids the phenomenon of chattering. Simulation results have been presented to illustrate the effectiveness of the presented control scheme. (C) 2019 Elsevier B.V. All rights reserved.

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作者: Jayananda, M (Jayananda, M.); Aadhiseshan, KR (Aadhiseshan, K. R.); Kusiak, MA (Kusiak, Monika A.); Wilde, SA (Wilde, Simon A.); Sekhamo, KU (Sekhamo, Kowete-u); Guitreau, M (Guitreau, M.); Santosh, M (Santosh, M.); Gireesh, RV (Gireesh, R. V.)

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摘要: The Dharwar Craton is a composite Archean cratonic collage that preserves important records of crustal evolution on the early Earth. Here we present results from a multidisciplinary study involving field investigations, petrology, zircon SHRIMP U Pb geochronology with in-situ Hf isotope analyses, and wholerock geochemistry, including Nd isotope data on migmatitic TTG (tonalite-trondhjemite-granodiorite) gneisses, dark grey banded gneisses, calc-alkaline and anatectic granitoids, together with synplutonic mafic dykes along a wide Northwest Southeast corridor forming a wide time window in the Central and Eastern blocks of the Dharwar Craton. The dark grey banded gneisses are transitional between TTGs and calc-alkaline granitoids, and are referred to as 'transitional TTGs', whereas the calc-alkaline granitoids show sanukitoid affinity. Our zircon U Pb data, together with published results, reveal four major periods of crustal growth (ca. 3360-3200 Ma, 3000-2960 Ma, 2700-2600 Ma and 2570-2520 Ma) in this region. The first two periods correspond to TTG generation and accretion that is confined to the western part of the corridor, whereas widespread 2670-2600 Ma transitional TTG, together with a major outburst of 2570-2520 Ma juvenile calc-alkaline magmatism of sanukitoid affinity contributed to peak continental growth. The transitional TTGs were preceded by greenstone volcanism between 2746 Ma and 2700 Ma, whereas the calc-alkaline magmatism was contemporaneous with 2570-2545 Ma felsic volcanism. The terminal stage of all four major accretion events was marked by thermal events reflected by amphibolite to granulite facies metamorphism at ca. 3200 Ma, 2960 Ma, 2620 Ma and 2520 Ma. Elemental ratios [(La/Yb)N, Sr/Y, Nb/Ta, Hf/Sm)] and Hf-Nd isotope data suggest that the magmatic protoliths of the TTGs emplaced at different time periods formed by melting of thickened oceanic arc crust at different depths with plagioclase + amphibole garnet + titanitefilmenite in the source residue, whereas the elemental (Ba Sr, [(La/Yb)N, Sr/Y, Nb/Ta, Hf/Sm)] and Hf-Nd isotope data [81-Ifm= 0.67 to 5.61; 8Nd(T) = 0.52 to 4.23;] of the transitional TTGs suggest that their protoliths formed by melting of composite sources involving mantle and overlying arc crust with amphibole + garnet + clinopyroxene plagioclase + ilmenite in the residue. The highly incompatible and compatible element contents (REE, K Ba Sr, Mg, Ni, Cr), together with Hf and Nd isotope data [81-If(T) = 4.5 to 3.2; 8Nd(T) =1.93 to 1.26;], of the sanukitoids and synplutonic dykes suggest their derivation from enriched mantle reservoirs with minor crustal contamination. Field, elemental and isotope data [81-1f(T) = 4.3 to 15.0; eNdm= 0.5 to 7.0] of the anatectic granites suggest their derivation through reworking of ancient as well as newly formed juvenile crust. Secular increase in incompatible as well as compatible element contents in the transitional TTGs to sanukitoids imply progressive enrichment of Neoarchean mantle reservoirs, possibly through melting of continent-derived detritus in a subduction zone setting, resulting in the establishment of a sizable continental mass by 2700 Ma, which in turn is linked to the evolving Earth. The Neoarchean geodynamic evolution is attributed to westward convergence of hot oceanic lithosphere, with continued convergence resulted in the assembly of micro -blocks, with eventual slab break-off leading to asthenosphere upwelling caused extensive mantle melting and hot juvenile magma additions to the crust.

This led to lateral flow of hot ductile crust and 3D mass distribution and formation of an orogenic plateaux with subdued topography, as indicated by strain fabric data and strong seismic reflectivity along an E-W crustal profile in the Central and Eastern blocks of the Dharwar Craton. (C) 2019 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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摘要: Parameter extraction of photovoltaic models based on measured current-voltage data plays an important role in the simulation, control, and optimization of photovoltaic systems. Although many parameter extraction techniques have been devoted to solving this problem, they may suffer from some deficiencies. In this paper, an enhanced adaptive differential evolution algorithm is proposed to extract photovoltaic parameters fast, accurately and reliably. In proposed method, the crossover rate sorting mechanism is introduced to assign each individual to an adapted crossover rate value according to their fitness values, which allows good elements to be more inherited in next generation. In addition, a dynamic population reduction strategy is used to improve the convergence speed and balance the exploration and exploitation. The performance of proposed method is confirmed by extracting parameters of different photovoltaic models, i.e., single diode, double diode, and photovoltaic modules. The simulated results show that the proposed method exhibits competitive performance on accuracy, reliability and convergence speed compared with other state-of-the-art algorithms. Further, the test results on experimental data from the manufacturers data sheet also indicate that the proposed algorithm can obtain superior solutions at different irradiance and temperature. Therefore, the proposed method can be an effective and efficient alternative for parameter extraction of photovoltaic models.

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摘要: Soil organic carbon (SOC) storage and stabilization under land-use change, including agricultural abandonment, are critical for the recuperation of soil productivity and feedback to climate change. A space-for-time substitution approach was applied to investigate the responses of soil aggregation, SOC storage and stabilization to agricultural abandonment in a small karst catchment in Southwest China. Soil aggregate distribution, SOC concentration and delta C-13 composition in bulk soils and different-sized aggregates in soil profiles under cropland, abandoned cropland and native vegetation land were determined. The results showed that SOC storage and soil aggregation were significantly reduced in the surface soils of croplands compared to those under native vegetation; SOC storage was slowly restored in 3-8 years abandoned cropland, but soil aggregation was rapidly recovered. The rapidly recovered macro-aggregates controlled the recuperation of SOC storage after agricultural abandonment because most SOC (64%-83%) was sequestrated by macro-aggregates. The relationships between SOC concentrations and delta C-13 values in different-sized aggregates of surface soils could indicate a change in SOC stabilization under land-use change. In this study, SOC stabilization was gradually enhanced following agricultural abandonment. These results suggest that soil aggregation, SOC storage and stabilization are recovered following agricultural abandonment in the karst region.

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文献类型: Article

作者关键词: Soil aggregates; SOC storage and stabilization; Agricultural abandonment; Karst soils; Southwest China

KeyWords Plus: LAND-USE CHANGE; DELTA-C-13 SIGNATURE; NORTHWEST GUANGXI; CLIMATE-CHANGE; TOTAL NITROGEN; NATURAL N-15; MATTER; FOREST; DECOMPOSITION; DYNAMICS

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标题: Application of nuclear magnetic resonance (NMR) in coalbed methane and shale reservoirs: A review

作者: Liu, ZS (Liu, Zhengshuai); Liu, DM (Liu, Dameng); Cai, YD (Cai, Yidong); Yao, YB (Yao, Yanbin); Pan, ZJ (Pan, Zhejun); Zhou, YF (Zhou, Yingfang)

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摘要: Nuclear magnetic resonance (NMR) has been applied widely and successfully in conventional and unconventional reservoirs, and can be used to investigate petrophysical properties and fluid flow characteristics. This non-destructive, sensitive, and quick technique has been utilized in determination of pore type, porosity, pore size distribution, permeability prediction, wettability estimation, and fluid type, state and flow behavior.

In this paper, the application of NMR to investigate coalbed methane and shale reservoirs is reviewed. Most of the reviewed studies are related to porosity and pore characteristics, which can be determined by analyzing the characteristics of the T-2 distribution, allowing for examination of pore type and pore connectivity as well as calculation of total porosity and pore size distribution. Permeability models developed for reservoir rocks and based on porosity determined using NMR are well established and have been extended or modified to evaluate the permeability of coal or shale. Reviewed studies also include wettability investigation by comparing the subtraction of T-2 distribution before and after fluid injection. Reviewed recent advances have further discussed the method of distinguishing fluid type, fluid state, and simulating fluid behavior using one-dimensional and two-dimensional NMR methods combined with changes of T-2 distribution. The aim of this review is to provide readers with an overview of the capabilities of NMR and its extension to scientific research by improving the parameter optimization of the instrument and establishing the calculation method for effective surface relaxivity for coals or shales.

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作者关键词: Nuclear magnetic resonance (NMR); Pore properties; Permeability prediction; Wettability; Fluid flow characteristics; Unconventional reservoir

KeyWords Plus: MERCURY INTRUSION POROSIMETRY; PORE-SIZE DISTRIBUTIONS; LOW-FIELD NMR; TO-VOLUME RATIO; HIGH-RANK COALS; GAS-ADSORPTION; PETROPHYSICAL CHARACTERIZATION; POROUS-MEDIA; C-13 NMR; SPONTANEOUS IMBIBITION

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标题: Stability and Bifurcation in a Predator-Prey System with Prey-Taxis

作者: Qiu, HH (Qiu, Huanhuan); Guo, SJ (Guo, Shangjiang); Li, SZ (Li, Shangzhi)

来源出版物: INTERNATIONAL JOURNAL OF BIFURCATION AND CHAOS 卷: 30 期: 2 文献号: 2050022 DOI: 10.1142/S0218127420500224 出版年: FEB 2020

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摘要: In this paper, we consider a generalized predator-prey system with prey-taxis under Neumann boundary condition, that is, the predators can survive even in the absence of the prey species. It is proved that for an arbitrary spatial dimension, the corresponding initial boundary value problem possesses a unique global bounded classical solution when the prey-taxis is restricted to a small range. Moreover, the local stabilities of constant steady states (including trivial, semitrivial and positive constant steady states) are investigated. A further study on the coexistence steady state implies that the prey-taxis term suppresses the global asyrnptotical stability and influences the steady-state/Hopf bifurcations (if they exist). Analyses of steady-state bifurcation, Hopf bifurcation, and even Hopf/steady-state mode interaction are carried out in detail by means of the Lyapunov-Schmidt procedure. In particular, we obtain stable or unstable steady states, time-periodic solutions, quasi-periodic solutions, and sphere-like surfaces of solutions. These results provide theoretical evidences to the complex spatiotemporal dynamics found in numerical simulations.

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语言: English

文献类型: Article

作者关键词: Reaction-diffusion; predator-prey; prey-taxis; global existence; stability; Hopf bifurcation

KeyWords Plus: REACTION-DIFFUSION SYSTEM; SPATIOTEMPORAL PATTERNS; MODEL; BOUNDEDNESS; DYNAMICS; STATES

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标题: Jute: A Potential Candidate for Phytoremediation of Metals-A Review

作者: Saleem, MH (Saleem, Muhammad Hamzah); Ali, S (Ali, Shafaqat); Rehman, M (Rehman, Muzammal); Hasanuzzaman, M (Hasanuzzaman, Mirza); Rizwan, M (Rizwan, Muhammad); Irshad, S (Irshad, Sana); Shafiq, F (Shafiq, Fahad); Iqbal, M (Iqbal, Muhammad); Alharbi, BM (Alharbi, Basmah M.); Alnusaire, TS (Alnusaire, Taghreed S.); Qari, SH (Qari, Sameer H.)

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摘要: Jute (Corchorus capsularis) is a widely cultivated fibrous species with important physiological characteristics including biomass, a deep rooting system, and tolerance to metal stress. Furthermore, Corchorus species are indigenous leafy vegetables and show phytoremediation potential for different heavy metals. This species has been used for the phytoremediation of different toxic pollutants such as copper (Cu), cadmium (Cd), zinc (Zn), mercury (Hg) and lead (Pb). The current literature highlights the physiological and morphological characteristics of jute that are useful to achieve successful phytoremediation of different pollutants. The accumulation of these toxic heavy metals in agricultural regions initiates concerns regarding food safety and reductions in plant productivity and crop yield. We discuss some innovative approaches to increase jute phytoremediation using different chelating agents. There is a need to remediate soils contaminated with toxic substances, and phytoremediation is a cheap, effective, and in situ alternative, and jute can be used for this purpose.

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文献类型: Review

作者关键词: fibrous crop; phytoextraction; environmental pollutants; morphological traits; soil remediation; chelating agents

KeyWords Plus: ACID ASSISTED PHYTOREMEDIATION; CITRIC-ACID; PLANT-GROWTH; HEAVY-METALS; CORCHORUS-OLITORIUS; CONTAMINATED SOILS; PHYTOEXTRACTION; COPPER; MECHANISMS; EDTA

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标题: Global projections of future urban land expansion under shared socioeconomic pathways

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摘要: Despite its small land coverage, urban land and its expansion have exhibited profound impacts on global environments. Here, we present the scenario projections of global urban land expansion under the framework of the shared socioeconomic pathways (SSPs). Our projections feature a fine spatial resolution of 1km to preserve spatial details. The projections reveal that although global urban land continues to expand rapidly before the 2040s, China and many other Asian countries are expected to encounter substantial pressure from urban population decline after the 2050s. Approximately 50-63% of the newly expanded urban land is expected to occur on current croplands. Global crop production will decline by approximately 1-4%, corresponding to the annual food needs for a certain crop of 122-1389 million people. These findings stress the importance of governing urban land development as a key measure to mitigate its negative impacts on food production.

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标题: Land use transitions and the associated impacts on ecosystem services in the Middle Reaches of the Yangtze River Economic Belt in China based on the geo-informatic Tupu method

作者: Chen, WX (Chen, Wanxu); Zhao, HB (Zhao, Hongbo); Li, JF (Li, Jiangfeng); Zhu, LJ (Zhu, Lijun); Wang, ZY (Wang, Zheye); Zeng, J (Zeng, Jie)

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摘要: Rapid urbanization in China has greatly exacerbated land use transitions (LUTs), which seriously threaten the ecosystem. The existing literature lacks information on the spatio-temporal analysis of LUTs, and assessments of ecosystem services remain incomplete. This lack of information may limit the formation and implementation of landscape plans and ecologically oriented policies. This study attempts to fill this gap by analysing the geographic features of LUTs with the geo-informatic Tupu method and exploring the responses of ecosystem services to LUTs. A newly revised benefit transfer method that utilizes the land use/land cover change data derived from the Landsat Enhanced Thematic Mapper (ETM) in the Middle Reaches of the Yangtze River Economic Belt (MRYREB) is implemented. The results indicate that the area of construction land continued to increase markedly, while the area of cultivated land declined continuously from 1995 to 2015. This increase in construction land was mainly derived from the occupation of cultivated land. The Tupu units of "forestland > cultivated land," "cultivated land > forestland," "cultivated land -> water area," and "water area -> cultivated land" were the dominant driving forces of the changes in ecosystem services value (ESV) in the MRYREB. Hotspots of ESV changes were mainly located in the surrounding mountainous areas during 1995-2005 and 2005-2010, while the coldspots during 2010-2015 were mainly located in the plains. The findings in this study have important implications for ecosystem conservation, ecological function zoning, ecological compensation decision-making, and related land development in the MRYREB. (C) 2019 Elsevier B.V. All rights reserved.

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作者关键词: Land use transition; Ecosystem services value; Geo-informatic Tupu; Benefit transfer method; Hotspot analysis; Middle Reaches of the Yangtze River; Economic Belt; China

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作者: Fan, JX (Fan, Jun-xuan); Shen, SZ (Shen, Shu-zhong); Erwin, DH (Erwin, Douglas H.); Sadler, PM (Sadler, Peter M.); MacLeod, N (MacLeod, Norman); Cheng, QM (Cheng, Qiu-ming); Hou, XD (Hou, Xu-dong); Yang, J (Yang, Jiao); Wang, XD (Wang, Xiang-dong); Wang, Y (Wang, Yue); Zhang, H (Zhang, Hua); Chen, X (Chen, Xu); Li, GX (Li, Guo-xiang); Zhang, YC (Zhang, Yi-chun); Shi, YK (Shi, Yu-kun); Yuan, DX (Yuan, Dong-xun); Chen, Q (Chen, Qing); Zhang, LN (Zhang, Lin-na); Li, C (Li, Chao); Zhao, YY (Zhao, Ying-ying)

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摘要: One great challenge in understanding the history of life is resolving the influence of environmental change on biodiversity. Simulated annealing and genetic algorithms were used to synthesize data from 11,000 marine fossil species, collected from more than 3000 stratigraphic sections, to generate a new Cambrian to Triassic biodiversity curve with an imputed temporal resolution of 26 14,9 thousand years. This increased resolution clarifies the timing of known diversification and extinction events. Comparative analysis suggests that partial pressure of carton dioxide (Pco(2)) is the only environmental factor that seems to display a secular pattern similar to that of biodiversity, but this similarity was not confirmed when autocorrelation within that time series was analyzed by detrending These results demonstrate that fossil data can provide the temporal and taxonomic resolutions necessary to test (paleo)biological hypotheses at a level of detail approaching those of long-term ecological analyses.

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作者: Yang, YJ (Yang, Yuanjian); Zheng, ZF (Zheng, Zuofang); Yim, SYL (Yim, Steve Y. L.); Roth, M (Roth, Matthias); Ren, GY (Ren, Guoyu); Gao, ZQ (Gao, Zhiqiu); Wang, TJ (Wang, Tijian); Li, QX (Li, Qingxiang); Shi, CN (Shi, Chune); Ning, GC (Ning, Guicai); Li, YB (Li, Yubin)

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摘要: Heavy PM2.5 (particulate matter with aerodynamic diameter equal to or less than 2.5 mu m) pollution and urban heat island (UHI) pose increasing threats to human health and living environment in populated cities. However, how PM2.5 pollution affects the UHI intensity (UHII) has not been fully understood. The impacts of PM2.5 on the wintertime UHII in the Beijing-Tianjin-Hebei megalopolis of China are explored during 2013-2017. The results show that the UHII at the time of daily maximum/minimum temperature (UHIImax/UHIImin) exhibits a decreasing/increasing tendency as PM2.5 concentration increases, causing a continuous decrease in the diurnal temperature range. These effects are mediated via aerosol-radiation interaction (aerosol-cloud interaction) under clear-sky (cloudy) condition. The changes in PM2.5 concentration further cause different relative trends of UHII(ma)x/UHIImin/diurnal temperature range across different cities in the Beijing-Tianjin-Hebei region, which are likely related to the differences in both the PM2.5 composition and city size. This study provides insights on how air pollution affects urban climate and would help to design effective mitigation strategies.

Plain Language Summary A detailed understanding of the relationship between PM2.5 (particulate matter with aerodynamic diameter equal to or less than 2.5 mu m) and the urban heat island (UHI) effect is significant for climate change adaption, planning, and sustainable development in urban regions. While the Beijing-Tianjin-Hebei (BTH) megalopolis of China is among the areas with the highest population densities and fastest urbanization rates in the world, the impacts of PM2.5 pollution on UHI, along with their regional differences in the BTH megalopolis, remain unclear. This study demonstrates that different PM2.5 concentrations in the BTH region pose various influences on the UHI intensities and their change rates in different cities of varying sizes. The UHI intensities during daytime and nighttime, respectively, exhibit weakening and strengthening tendency as PM2.5 concentration increases. These effects are mediated via aerosol-radiation interaction under clear-sky condition and aerosol-cloud interaction in cloudy weather. The relative changes in the UHI magnitudes were mainly determined by PM2.5 composition and city size. The asymmetrical influences of PM2.5 on the daytime and nighttime UHI intensities caused continuous decreases in the diurnal temperature ranges in the urban areas as the pollution level increased. Our study improves the understanding of urban climate affected by air pollution and provides a scientific basis for the mitigation of UHI impacts.

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标题: Nanoscale pore structure and mechanical property analysis of coal: An insight combining AFM and SEM images

作者: Li, Y (Li, Yong); Yang, JH (Yang, Jianghao); Pan, ZJ (Pan, Zhejun); Tong, WS (Tong, Wangshu)

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摘要: Scanning Electron Microscopy (SEM) and Atomic Force Microscope (AFM), two easily acquired and widely applied image acquisition and analysis methods, have rarely been combined to study the pore structure for unconventional natural gas reservoir rocks. In this work, we present an investigation of nanoscale detection of the pore distribution and mechanical properties of coals using SEM and AFM observations, and conduct quantitative analyses on pore structure distribution, surface roughness and mechanical properties. The morphological characteristics of the coal surface can be revealed by both SEM and AFM methods, and the mechanical parameters of the selected position were obtained under the peakforce quantitative nano-mechanics (PF-QNM) AFM mode, including the Young's modulus, peak force error, deformation, and adhesion forces. By fusing 800 high resolution SEM images into one single image (named as MAPS), the pores morphology and distribution of different scales were acquired. And the studied coal shows different types of cellular pores and gas pores with multiresolution. The mechanical property difference between the matrix and minerals of coal are clearly observed, with the Young's modulus of organic component around 2 GPa, and that of the minerals generally higher than 10 GPa. The maximum adhesion force values range between 20 and 50 nN. The high values occurred where pores are developed. This work demonstrated that the combination of two dimensional (2D) SEM and three dimensional (3D) AFM results is effective in detection of surface properties, and is of significance in revealing the pore structure and mechanical properties at nanoscale.

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标题: A ratiometric optical thermometer with multi-color emission and high sensitivity based on double perovskite LaMg0.402Nb0.598O3: Pr3+ thermochromic phosphors

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摘要: Currently, non-contact fluorescence intensity ratio (FIR)-based luminescent thermometry has been extensively attracted great attention for its promising applications in electromagnetic field, micro-temperature field and thermally harsh environments. In this work, the double-perovskite LaMg0.402Nb0.598O3: Pr3+ (LMNO: Pr3+) thermometric phosphor is firstly designed and successfully synthesized via a high-temperature solid-state method. Under 450 nm excitation, the as-prepared samples simultaneously exhibit blue emission (P-3(0) -> H-3(4)), green emission (P-3(1 )-> H-3(4)) and red emission (D-1(2) -> H-3(4), P-3(0) -> F- 3(2)) of Pr3+. They present different dependence on the temperature due to the intervalence charge transfer state (IVCT). Accordingly, the four FIR models between P-3(1 )-> H-3(4) and P-3(0 )-> H-3(4) (G/B), P-3(1 )-> H-3(4) and P-3(0) -> F-3(2) (G/R2), D-1(2) -> H-3(4) and P-3(0) -> H-3(4) (R1/B) and D-1(2) -> H-3(4) and P-3(0) -> F- 3(2) (R1/R2) are used as temperature detecting signal in the range of 298-523 K, and the maximum absolute and relative sensitivity of LaMg0.402Nb0.598O3: 1.2% Pr3+ sample reached 0.0597K(-1) at 523 K and 0.7250% K-1 at 473 K, respectively. Excellent temperature sensing features are also demonstrated in the LaMg0.402Nb0.598O3: 0.3% Pr3+ and LaMg0.402Nb0.598O3: 2.0% Pr3+ samples. Except for high sensitivity for temperature sensing, the designed Pr3+-doped double-perovskite materials also realize the self-calibration by simultaneous monitoring of four models of FIR. Moreover, after five cycles, the relative luminescence intensity of LaMg0.402Nb0.598O3: 1.2% Pr3+ sample remains stable. These results indicate that LaMg0.402Nb0.598O3: Pr3+ phosphors have great promising application as self-calibrated optical temperature sensors.

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摘要: Photocatalytic activity is largely restricted by insufficient photoabsorption and intense recombination between charge carriers. Here, we first synthesized Bi4NbO8Cl nanosheets with {001} exposing facets by a molten-salt growth method, which shows largely promoted photocatalytic performance for the degradation of tetracycline (TC) and bisphenol A (BPA) in comparison with Bi4NbO8Cl particles obtained by solid-state reaction. The 2D/2D Bi4NbO8Cl/g-C3N4 heterojunction photocatalysts were then fabricated via high-energy ball-milling and post-sintering to realize intimate interfacial interaction. The photocatalytic activity of all the Bi4NbO8Cl/g-C3N4 composites largely enhances compared to Bi4NbO8Cl nanosheets and g-C3N4, also far exceeding the mechanically-mixed Bi4NbO8Cl nanosheets and g-C3N4. The impact of different reaction parameters on the photocatalytic degradation activities was investigated, including catalyst concentration, pH value and TC concentration. In addition, Bi4NbO8Cl/g-C3N4 also presents improved photocatalytic CO2 reduction activity for CO production. The large enhancement on photocatalytic activity of Bi4NbO8Cl/g-C3N4 composites is owing to the synergistic effect of favorable 2D/2D structure and construction of type II heterojunction with intimate interfacial interaction, thus boosting the charge separation. The formation of type II heterojunction was evidenced by selective photo-deposition of Pt and MnOx, which demonstrate that the reductive sites and oxidative sites are on Bi4NbO8Cl nanosheets and g-C3N4, respectively. This work may provide some insights into fabrication of efficient visible-light driven photocatalysts for environmental and energy applications.

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语言: English

文献类型: Article

作者关键词: Bi4NbO8Cl nanosheets; g-C3N4 heterojunction; Photodegradation; CO2 reduction

KeyWords Plus: CONSTRUCTION; FABRICATION; ULTRATHIN; EVOLUTION; HETEROSTRUCTURE; TRANSFORMATION; MICROSPHERES; PERFORMANCE; SEPARATION; STRATEGY

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标题: Plate Tectonics and the Archean Earth

作者: Brown, M (Brown, Michael); Johnson, T (Johnson, Tim); Gardiner, NJ (Gardiner, Nicholas J.)

编者: Jeanloz R; Freeman KH

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摘要: If we accept that a critical condition for plate tectonics is the creation and maintenance of a global network of narrow boundaries separating multiple plates, then to argue for plate tectonics during the Archean requires more than a local record of subduction. A case is made for plate tectonics back to the early Paleoproterozoic, when a cycle of breakup and collision led to formation of the supercontinent Columbia, and bimodal metamorphism is registered globally. Before this, less preserved crust and survivorship bias become greater concerns, and the geological record may yield only a lower limit on the emergence of plate tectonics. Higher mantle temperature in the Archean precluded or limited stable subduction, requiring a transition to plate tectonics from another tectonic mode. This transition is recorded by changes in geochemical proxies and interpreted based on numerical modeling. Improved understanding of the secular evolution of temperature and water in the mantle is a key target for future research.

Higher mantle temperature in the Archean precluded or limited stable subduction, requiring a transition to plate tectonics from another tectonic mode.

Plate tectonics can be demonstrated on Earth since the early Paleoproterozoic (since c. 2.2 Ga), but before the Proterozoic Earth's tectonic mode remains ambiguous.

The Mesoarchean to early Paleoproterozoic (3.2-2.3 Ga) represents a period of transition from an early tectonic mode (stagnant or sluggish lid) to plate tectonics.

The development of a global network of narrow boundaries separating multiple plates could have been kick-started by plume-induced subduction.

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语言: English

文献类型: Review; Book Chapter

作者关键词: tectonic mode; subduction; plume; metamorphism; mantle TP; geochemistry

KeyWords Plus: TRONDHJEMITE-GRANODIORITE TTG; PLUME-INDUCED SUBDUCTION; ISUA GREENSTONE-BELT; ITSAQ GNEISS COMPLEX; CONTINENTAL-CRUST; THERMAL EVOLUTION; PILBARA CRATON; WEST GREENLAND; FELSIC CRUST; HADEAN CRUST

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By necessity, in attempting to cover such a broad and (currently) popular topic, we have been able to cite only a small proportion of the relevant published literature. In most instances we have cited recent contributions, such that the interested reader may more easily follow the historical trail of ideas pertaining to Archean tectonics. T.J. acknowledges support from the State Key Laboratory for Geological Processes and Mineral Resources, China University of Geosciences, Wuhan (Open Funds GPMR201704 and GPMR201903). N.J.G. acknowledges Australian Research Council grant FL160100168 for financial support. We thank Dr. Marzieh Baes of the Helmholtz Centre Potsdam for provision of vector files that we modified in producing Figures 5 and 6. We are grateful to P. Cawood, C. Hawkesworth, and R. Rudnick for their comments that undoubtedly improved the published version of the paper. Any remaining errors or misconceptions are ours.

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标题: Infrared and visible image fusion based on target-enhanced multiscale transform decomposition

作者: Chen, J (Chen, Jun); Li, XJ (Li, Xuejiao); Luo, LB (Luo, Linbo); Mei, XG (Mei, Xiaoguang); Ma, JY (Ma, Jiayi)

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摘要: In this study, we propose a target-enhanced multiscale transform (MST) decomposition model for infrared and visible image fusion to simultaneously enhance the thermal target in infrared images and preserve the texture details in visible images. The Laplacian pyramid is initially used to separately decompose two pre-registered source images into low- and high-frequency bands. The common "max-absolute" fusion rule is performed for fusion for high-frequency bands. We use the decomposed infrared low-frequency information to determine the fusion weight of low-frequency bands and highlight the target. Meanwhile, a regularization parameter is introduced to dominate the proportion of the infrared features in a gentle manner, which can be further adjusted according to user requirements. Finally, we use inverse transform with the Laplacian pyramid (LP) to reconstruct the fused image. Qualitative and quantitative experimental results on publicly available datasets demonstrate that the proposed method can generate fused images with clearly highlighted targets and abundant details. These images exhibit better visual effects and objective metric values than those of five other commonly used MST decomposition methods. (C) 2019 Elsevier Inc. All rights reserved.

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文献类型: Article

作者关键词: Image fusion; Multiscale transform; Fusion rule; Target-enhanced; Infrared

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作者: Dai, J (Dai, Jun); Li, YH (Li, Yinghao); Long, Z (Long, Zi); Jiang, RM (Jiang, Ruming); Zhuang, ZY (Zhuang, Zeyan); Wang, ZM (Wang, Zhiming); Zhao, ZJ (Zhao, Zujin); Lou, XD (Lou, Xiaoding); Xia, F (Xia, Fan); Tang, BZ (Tang, Ben Zhong)

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摘要: Photodynamic therapy (PDT) strategy has been widely used in tumor treatment, and the reagents for reactive oxygen species (ROS) play a crucial role. Herein, we develop a fluorogen (TTB) containing an electron-accepting benzo[1,2-b:4,5-b']dithiophene 1,1,5,5-tetraoxide core and electron-donating 4,4'-(2,2-diphenylethene-1,1-diyl)bis(N,N-diphenylaniline) groups for image-guided targeting PDT application. TTB exhibits a prominent aggregation-induced emission (AIE) property with strong near-infrared (NIR) fluorescence in aggregates and is capable of efficiently generating ROS of O-2(center dot)- and O-1(2) under white light irradiation. The nanoparticles (RGD-4R-MPD/TTB NPs) with NIR emission (similar to 730 nm), high photostability, and low dark cytotoxicity are fabricated by encapsulating TTB within polymeric matrix and then modified with RGD-4R peptide. They show excellent performance in targeting PDT treatment of PC3, HeLa, and SKOV-3 cancer cells in vitro. The investigations on pharmacokinetics, biodistribution, and long-term tracing in vivo reveal that RGD-4R-MPD/TTB NPs can selectively accumulate in tumors for real-time, long-term image-guided PDT treatment. The RGD-4R-MPD/TTB NPs-mediated PDT in multiple xenograft tumor models disclose that the growth of cervical, prostate, and ovarian cancers in mice can be effectively inhibited. These results demonstrate that the reagents employing NIR fluorogen TTB as a photosensitizer could be promising candidates for in vivo image-guided PDT treatments of tumors.

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作者关键词: photodynamic therapy; aggregation-induced emission; nanoparticle; fluorescence imaging; near-infrared photosensitizer

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摘要: The direct combustion of typical charring material, with wood as the main representative, has received extensive attention due to its potential as sustainable source of heat and power generation, and the substantial fraction of fuel load in many building fires. In real fire situations, multi-component condensed phase reactants and gas products are involved in the pyrolysis process and the subsequent combustion process. Interestingly, the numerical simulation of these multi-component reactions is relatively not yet well studied. To address this shortcoming, we consider how the reactants can be dealt with using a three-component parallel reaction mechanism and moisture model embedded into the pyrolysis model, wherein the reaction kinetic parameters are optimized by Shuffled Complex Evolution algorithm. The evolved gas products, measured by the TG-FTIR experiment, can be coupled with the extended EDC multicomponent combustion model and soot model using FireFOAM. Most of the thermophysical parameters are measured directly by experiments as the input values of simulation. In this work, the predicted results of mass loss rate and heat release rate are compared with experimental data of cone calorimetry, and the good agreement between them validates the applicability of the current multi-component model. Moreover, the effects of three sub-models (three-component parallel reaction mechanism, multiple evolved gas products and the extended EDC multi-component combustion model) are further analyzed based upon the predicted results. (C) 2019 The Combustion Institute. Published by Elsevier Inc. All rights reserved.

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文献类型: Article

作者关键词: Charring material; Material flammability; Multi-component; Fire; FireFOAM

KeyWords Plus: LARGE-EDDY SIMULATION; REACTION KINETIC-PARAMETERS; BENCH-SCALE PYROLYSIS; FLAME SPREAD; EXPERIMENTAL VALIDATION; OPTIMIZATION SCHEMES; THERMAL-DEGRADATION; MODELING PYROLYSIS; BIOMASS PYROLYSIS; WOODY BIOMASS

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标题: New method to calculate apparent phase velocity of open-ended pipe pile

作者: Wu, WB (Wu, Wenbing); Liu, H (Liu, Hao); Yang, XY (Yang, Xiaoyan); Jiang, GS (Jiang, Guosheng); El Naggar, MH (El Naggar, M. Hesham); Mei, GX (Mei, Guoxiong); Liang, RZ (Liang, Rongzhu)

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摘要: The apparent phase velocity of open-ended pipe piles after installation is difficult to predict owing to the soil-plug effect. This paper derives an analytical solution to calculate the apparent phase velocity of a pipe pile segment with soil-plug filling inside (APVPSP) based on the additional mass model. The rationality and accuracy of the developed solution are confirmed through comparison with the solution derived using the soil-plug Winkler model and experimental results. A parameter combination of the additional mass model that can be applied to concrete pipe piles used most commonly is recommended. The attenuation mechanism of the soil plug on the APVPSP is clarified. The findings from this study demonstrate that the APVPSP decreases with the mass per unit length of the pile, but has nothing to do with the material longitudinal wave velocity of the pipe pile. The APVPSP decreases significantly as the impulse width increases; however, for pipe piles without soil-plug filling inside, the impulse width has negligible influence on the apparent phase velocity.

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作者关键词: apparent phase velocity; soil plug; pipe pile; additional mass model; low strain test

KeyWords Plus: VERTICAL DYNAMIC-RESPONSE; WAVE-PROPAGATION; VIBRATION; MODEL

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标题: Ancient deep roots for Mesozoic world-class gold deposits in the north China craton: An integrated genetic perspective

作者: Yang, CX (Yang, Cheng-Xue); Santosh, M (Santosh, M.)

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摘要: The North China Craton (NCC) hosts some of the world-class gold deposits that formed more than 2 billion years after the major orogenic cycles and cratonization. The diverse models for the genesis of these deposits remain equivocal, and mostly focused on the craton margin examples, although synchronous deposits formed in the interior domains. Here we adopt an integrated geological and geophysical perspective to evaluate the possible factors that contributed to the formation of the major gold deposits in the NCC. In the Archean tectonic framework of the NCC, the locations of the major gold deposits fall within or adjacent to greenstone belts or the margins of micro-continents. In the Paleoproterozoic framework, they are markedly aligned along two major collisional sutures - the Trans North China Orogen and the Jiao-Liao-Ji Belt. Since the Mesozoic intrusions hosting these deposits do not carry adequate signals for the source of gold, we explore the deep roots based on available geophysical data. We show that the gold deposits are preferentially distributed above zones of uplifted MOHO and shallow LAB corresponding to thinned crust and eroded sub-lithospheric mantle, and that the mineralization is located above regions of high heat flow representing mantle upwelling. The NCC was at the center of a multi-convergent regime during the Mesozoic which intensely churned the mantle and significantly enriched it. The geophysical data on Moho and LAB upwarp from the centre towards east of the craton is more consistent with paleo-Pacific slab subduction from the east exerting the dominant control on lithospheric thinning. Based on these results, and together with an evaluation of the geochemical and isotopic features of the Mesozoic magmatic intrusions hosting the gold mineralization, we propose a genetic model that invokes reworking of ancient Au archives preserved in the lower crust and metasomatised upper mantle and which were generated through multiple subduction, underplating and cumulation events associated with cratonization of the NCC as well as the subduction-collision of Yangtze Craton with the NCC. The heat and material input along zones of heterogeneously thinned lithosphere from a rising turbulent mantle triggered by Mesozoic convergent margins surrounding the craton aided in reworking the deep roots of the ancient Au reservoirs, leading to the major gold metallogeny along craton margins as well as in the interior of the NCC. (C) 2019, China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V.

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作者关键词: Gold metallogeny; Subduction tectonics; Lithospheric thinning; Mantle metasomatism; North China craton

KeyWords Plus: LITHOSPHERE BENEATH; DESTRUCTION; METALLOGENESIS; GEOCHRONOLOGY; EVOLUTION; KEY; MINERALIZATION; CONSTRAINTS; MODEL

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作者: Yousefpour, A (Yousefpour, Amin); Jahanshahi, H (Jahanshahi, Hadi); Munoz-Pacheco, JM (Munoz-Pacheco, Jesus M.); Bekiros, S (Bekiros, Stelios); Wei, ZC (Wei, Zhouchao)

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摘要: We introduce for the first time a fractional-order hyperchaotic economic system. In this system, chaos generation depends upon the value of fractional-order. For certain fractional orders, a sustained regime of chaos is obtained. Also, the transient chaos phenomenon is detected for lower fractional orders. The dynamical behavior of the system is numerically investigated using bifurcations diagrams, basins of attraction, and Lyapunov exponents. Next, an adaptive terminal sliding mode control (ATSMC) with neural network estimator for finite-time stabilization and synchronization of the fractional-order system has been proposed. The radial basis function (RBF) neural network is used to achieve the estimation of the unknown function of the system. Also, the effects of external disturbances are fully taken into account with neural network estimator. The weights of the RBF neural network are updated based on the appropriate adaptation law. Using the fractional version of the Lyapunov stability theorem, the finite-time convergence of the closed-loop system has been proven. Finally, the new control technique is used for control and synchronization of the fractional-order hyperchaotic economic system. Simulation results illustrate the effectiveness of the proposed control scheme for uncertain fractional-order systems in the presence of external disturbances. (C) 2019 Elsevier Ltd. All rights reserved.

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标题: Sulfur-based mixotrophic bio-reduction for efficient removal of chromium (VI) in groundwater

作者: Zhang, BG (Zhang, Baogang); Wang, ZL (Wang, Zhongli); Shi, JX (Shi, Jiaxin); Dong, HL (Dong, Hailiang)

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摘要: Organic matter and reduced sulfur compounds commonly coexist in groundwater aquifers and their respective roles in Cr (VI) bio-reduction have been well established, but Cr(VI) bio-reduction under mixotrophic condition, where organics and elemental sulfur simultaneously occur as co-donors of electrons, remains largely unknown. Herein a sulfur-based mixotrophic bio-reduction process is demonstrated to be effective to detoxify Cr(VI), with a removal efficiency of 95.5 +/- 0.74% within 48 h at an initial concentration of 50 mg/L. In addition to direct reduction by heterotrophic Cr(VI) reducers such as Desulfovibrio and Desulfuromonas, volatile fatty acids (VFAs) produced from autotrophic sulfur oxidation served as electron donors for heterotrophic Cr(VI) reducers. Part of VFAs was also assimilated and accumulated as glycogen within cells, which enhanced their Cr(VI) removal capacity. Metabolic pathway analysis suggested that Cr(VI) was reduced to insoluble Cr(III) both extracellularly by cytochrome c and intracellularly by nicotinamide adenine dinucleotide in the presence of upregulated chrA gene. Constituents of extracellular polymeric substances (EPS) also contributed to Cr(VI) reduction enzymatically, through binding of toxic Cr(VI) by carboxyl and hydroxyl groups. Results from this study have important implications for understanding the biogeochemical behavior and environmental remediation of Cr(VI) in groundwater aquifers and sediments/soils. (C) 2019 Elsevier Ltd. All rights reserved.

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KeyWords Plus: IN-SITU REMEDIATION; HEXAVALENT CHROMIUM; VANADIUM V; MICROBIAL REDUCTION; ELEMENTAL-SULFUR; SP NOV.; DENITRIFICATION PROCESSES; CR(VI) REDUCTION; WATER TREATMENT; GEN. NOV.

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标题: Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey

作者: Zhong, BL (Zhong, Bao-Liang); Luo, W (Luo, Wei); Li, HM (Li, Hai-Mei); Zhang, QQ (Zhang, Qian-Qian); Liu, XG (Liu, Xiao-Ge); Li, WT (Li, Wen-Tian); Li, Y (Li, Yi)

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摘要: Unprecedented measures have been adopted to control the rapid spread of the ongoing COVID-19 epidemic in China. People's adherence to control measures is affected by their knowledge, attitudes, and practices (KAP) towards COVID-19. In this study, we investigated Chinese residents' KAP towards COVID-19 during the rapid rise period of the outbreak. An online sample of Chinese residents was successfully recruited via the authors' networks with residents and popular media in Hubei, China. A self-developed online KAP questionnaire was completed by the participants. The knowledge questionnaire consisted of 12 questions regarding the clinical characteristics and prevention of COVID-19. Assessments on residents' attitudes and practices towards COVID-19 included questions on confidence in winning the battle against COVID-19 and wearing masks when going out in recent days. Among the survey completers (n=6910), 65.7% were women, 63.5% held a bachelor degree or above, and 56.2% engaged in mental labor. The overall correct rate of the knowledge questionnaire was 90%. The majority of the respondents (97.1%) had confidence that China can win the battle against COVID-19. Nearly all of the participants (98.0%) wore masks when going out in recent days. In multiple logistic regression analyses, the COVID-19 knowledge score (OR: 0.75-0.90, P<0.001) was significantly associated with a lower likelihood of negative attitudes and preventive practices towards COVID-2019. Most Chinese residents of a relatively high socioeconomic status, in particular women, are knowledgeable about COVID-19, hold optimistic attitudes, and have appropriate practices towards COVID-19. Health education programs aimed at improving COVID-19 knowledge are helpful for Chinese residents to hold optimistic attitudes and maintain appropriate practices. Due to the limited sample representativeness, we must be cautious when generalizing these findings to populations of a low socioeconomic status.

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作者: Zhong, LH (Zhong, Linhao); Mu, L (Mu, Lin); Li, J (Li, Jing); Wang, JY (Wang, Jiaying); Yin, Z (Yin, Zhe); Liu, DR (Liu, Darong)

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摘要: The 2019 novel coronavirus (2019-nCoV) outbreak has been treated as a Public Health Emergency of International Concern by the World Health Organization. This work made an early prediction of the 2019-nCoV outbreak in China based on a simple mathematical model and limited epidemiological data. Combing characteristics of the historical epidemic, we found part of the released data is unreasonable. Through ruling out the unreasonable data, the model predictions exhibit that the number of the cumulative 2019-nCoV cases may reach 76,000 to 230,000, with a peak of the unrecovered infectives (22,000-74,000) occurring in late February to early March. After that, the infected cases will rapidly monotonically decrease until early May to late June, when the 2019-nCoV outbreak will fade out. Strong anti-epidemic may reduce the cumulative infected cases by 40 & x0025;-49 & x0025;. The improvement of medical care can also lead to about one-half transmission decrease and effectively shorten the duration of the 2019-nCoV.

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作者关键词: Mathematical model; Sociology; Statistics; Predictive models; Viruses (medical); Urban areas; Diseases; Epidemic transmission; infection rate; mathematical model; novel coronavirus; prediction; removal rate

KeyWords Plus: INFECTION; SARS

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摘要: Functional zone reflects city's spatial structures, and as a carrier of social and economic activities, it is of critical significance to urban management, resource allocation and planning. However, most researches on functional zone division are based on a large spatial scale such as blocks or other scales larger than it. Aiming at a subtle fine functional result, the concept of Super Object (SO) was especially explained, also a Super Object - Convolutional Neural Network (SO-CNN) based urban functional zone fine division method with very high resolution (VHR) remote sensing image was proposed. The original image was firstly segmented into different SOs which correspond to the basic functional zone units in geography. A random point generation algorithm was used to generate the voting points for functional zone category identification, and then a trained CNN model was employed to assign functional attributes to those voting points. Then a statistical method was involved to count the frequency of the classified voting points of different functional attributes in each basic functional zone units. By voting process, the functional attribute with the highest frequency was assigned to the basic functional zone unit, which corrected the misclassification results of CNN to some extent. This paper also explored the scale effect of the SO on the final functional zone classification result from two aspects, spatial scale of SO and the sampling window size of CNN model. Because of the natural differences between functional zone division and land cover classification, region based overall accuracy assessment method was used to evaluate functional zone division result. Compared with other methods, SO-CNN method can generate higher accuracy and subtle result, based on which larger spatial scale results can be available by scaling-up, so SO-CNN method plays a great significant role on small scale functional space structure research.

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语言: English

文献类型: Article

作者关键词: Super object; Basic functional zone unit; CNN; Category identification of functional zone unit

KeyWords Plus: RURAL-NATURAL GRADIENT; SPATIAL HETEROGENEITY; LANDSCAPE PATTERN; LAND-COVER; CLASSIFICATION; SEGMENTATION; FEATURES; ECOLOGY; POINTS; SPRAWL

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标题: Facile preparation of porous Mn/Fe3O4 cubes as peroxymonosulfate activating catalyst for effective bisphenol A degradation

作者: Du, JK (Du, Jiangkun); Bao, JG (Bao, Jianguo); Liu, Y (Liu, Ying); Kim, SH (Kim, Sang Hoon); Dionysiou, DD (Dionysiou, Dionysios D.)

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摘要: Metal oxides are potentially interesting catalysts for activating peroxymonosulfate (PMS) for the degradation of recalcitrant contaminants. This study presents a magnetic porous Mn-Fe binary oxide (p-Mn/Fe3O4) in micronsize with abundant micro- and meso- pores. This novel catalyst exhibited high efficacy and long-term stability in activating PMS for degradation of bisphenol A (BPA). Sulfate radicals and hydroxyl radicals were identified from catalytic PMS activation according to electron paramagnetic resonance (EPR) characterization. The effects of Fe/Mn ratio, catalyst dose, initial pH and temperature were investigated. Compared to monometallic oxides, p-Mn/Fe3O4 exhibited a better catalytic performance because of the significant synergy between Mn and Fe species. Several BPA intermediates were identified. On the basis of bio-toxicity assay and TOC measurements, BPA transformed to some toxic intermediates during the initial reaction stage, and then decomposed efficiently to low toxicity products and mineralized to carbon dioxide and water molecules. This study shows that p-Mn/Fe3O4 is an efficient and environmentally benign catalyst for PMS oxidation of organic pollutants.

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语言: English

文献类型: Article

作者关键词: Porous catalyst; Mn/Fe3O4; Peroxymonosulfate; Bisphenol A; Catalytic degradation

KeyWords Plus: FENTON-LIKE CATALYST; HYDROXYL RADICALS; HETEROGENEOUS CATALYSTS; PERSULFATE OXIDATION; PHENOL DEGRADATION; ORGANIC POLLUTANTS; MANGANESE OXIDES; SULFATE; MN; GENERATION

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标题: Coseismic Rupture Process of the Large 2019 Ridgecrest Earthquakes From Joint Inversion of Geodetic and Seismological Observations

作者: Liu, CL (Liu, Chengli); Lay, T (Lay, Thorne); Brodsky, EE (Brodsky, Emily E.); Dascher-Cousineau, K (Dascher-Cousineau, Kelian); Xiong, X (Xiong, Xiong)

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摘要: On 4 and 6 July 2019, two large strike-slip earthquakes with W-phase moment magnitudes M-WW 6.5 (foreshock) and M-WW 7.1 (mainshock) struck the Eastern California Shear Zone, northeast of Ridgecrest. The faulting geometry and kinematic coseismic slip distribution of both events are determined by jointly inverting seismological and geodetic observations guided by aftershock and surface rupture locations. The foreshock ruptured two orthogonal faults with a prominent L-shaped geometry with maximum slip of similar to 1.1 m on the NE-SW segment. The mainshock faulting extended NW-SE along several primary fault segments that straddle the foreshock slip. The surface rupture and slip model indicate mostly near-horizontal strike-slip motion with maximum slip of similar to 3.7 m, but there is a localized vertical dip-slip motion. Both the foreshock and mainshock ruptures terminate in regions of complex surface offsets. High aftershock productivity and low rupture velocity may be the result of rupture of a relatively immature fault system.

Plain Language Summary Two large earthquakes on 4 July 2019 (magnitude 6.5) and 6 July 2019 (magnitude 7.1) struck northeast of Ridgecrest, California. Earthquakes such as the 1995 Ridgecrest earthquake have occurred previously in this broad region, called the Eastern California Shear Zone, but the deformation is not concentrated into a dominant single fault. The first rupture involved slip on two perpendicular faults, one aligned NE-SW and the other NW-SE, with slip and aftershocks forming an Lshaped pattern. Most slip was on the NE-SW fault. The mainshock ruptured a sequence of NW-SE trending faults, with slip extending across the short NW-SE segment ruptured in the foreshock. Both ruptures were delimited by zones of multiple surface fractures. The rupture for the mainshock expanded relatively slowly with low radiated energy, and a large number of aftershocks occurred, suggesting rupture of an immature segmented fault system.

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语言: English

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作者关键词: Ridgecrest Earthquakes; Foreshock; Triggering; Perpendicular Faulting; Eastern California Shear Zone; Strike-slip Faulting

KeyWords Plus: 1999 HECTOR MINE; W 7.9 GULF; STRONG-MOTION; ALASKA EARTHQUAKE; SLIP HISTORY; CALIFORNIA; KODIAK; MODEL; GPS

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标题: Geohazards in the three Gorges Reservoir Area, China Lessons learned from decades of research

作者: Tang, HM (Tang, Huiming); Wasowski, J (Wasowski, Janusz); Juang, CH (Juang, C. Hsein)

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摘要: The impoundment of the 660-km long reservoir behind the huge Three Gorges Dam, the world's largest hydropower station, increased regional seismicity and reactivated severe geohazards. Before the reservoir filling was initiated in 2003, the region had approximately two earthquakes per year with magnitudes between 3.0 and 4.9; after the full impoundment in 2008, approximately 14 earthquakes per year occurred with magnitudes between 3.0 and 5.4. In addition, hundreds of landslides were reactivated and are now in a state of intermittent creep. Many landslides exhibit step-like annual pattern of displacement in response to quasi-regular variations in seasonal rainfall and reservoir level. Additional problems include rock avalanches, impulse waves and debris flows. The seriousness of these events motivated numerous studies that resulted in 1) Better insight into the behavior and evolution mechanism of geohazards in the Three Gorges Reservoir Area (TGRA); 2) Implementation of monitoring and early-warning systems of geohazards; and 3) Design and construction of preventive countermeasures including lattice anchors, stabilizing piles, rock bolts, drainage canals and tunnels, and huge revetments. This paper reviews the hydro-geologic setting of TGRA geohazards, examines their occurrence and evolution in the past few decades, offers insight learned from extensive research on TGRA geohazards, and suggests topics for future research to address the remaining challenges.

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语言: English

文献类型: Review

作者关键词: Geohazard; Landslide; Earthquake; Hazard mitigation; Three Gorges Reservoir

KeyWords Plus: WATER-LEVEL FLUCTUATIONS; STABILIZING PILES; QIANJIANGPING LANDSLIDE; MAJIAGOU LANDSLIDE; CAUSAL FACTORS; PHREATIC LINE; ROCK SLOPES; ZONE SOIL; DEFORMATION; MECHANISM

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标题: Insights into interactions between vanadium (V) bio-reduction and pentachlorophenol dechlorination in synthetic groundwater

作者: Zhang, BG (Zhang, Baogang); Cheng, YT (Cheng, Yutong); Shi, JX (Shi, Jiaxin); Xing, X (Xing, Xuan); Zhu, YL (Zhu, Yuling); Xu, N (Xu, Nan); Xia, JX (Xia, Jianxin); Borthwick, AGL (Borthwick, Alistair G. L.)

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摘要: Aquifer co-contamination by vanadium (V) and pentachlorophenol (PCP) involves complicated biogeochemical processes that remain poorly understood, particularly from the perspective of microbial metabolism. Batch experiment results demonstrated that V(V) and PCP could be competitively bio-reduced, with 96.0 +/- 1.8% of V (V) and 43.4 +/- 4.6% of PCP removed during 7 d operation. V(V) was bio-transformed to vanadium (IV), which could precipitate naturally under circumneutral conditions, facilitating the removal of up to 78.2 +/- 3.1% dissolved total V. The PCP reductive dechlorination products were mainly 2,4,6-trichlorophenol and 4-mono-chlorophenol with lower toxicity. High-throughput 16S rRNA gene sequencing indicated that Pseudomonas, Soehngenia, and Anaerolinea might be responsible for the two bio-transformations, with detected functional genes of nirS and cprA. Extracellular reduction by cytochrome c and intracellular conversion by nicotinamide adenine dinucleotide (NADH) occurred for both V(V) and PCP. Extracellular proteins in microbial-secreted extracellular polymeric substances (EPS) might also be involved in these enzymatic bioprocesses. EPS could protect microbial cells through V(V) binding by the chemically reactive carboxyl (COO-), and hydroxyl (-OH) groups. These findings elucidate the metabolic processes during anaerobic V(V) and PCP biotransformation, advance understanding of their biogeochemical fates, and provide a foundation on which to develop novel strategies for remediation of co-contaminated aquifers.

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语言: English

文献类型: Article

作者关键词: Vanadium (V); Pentachlorophenol; Microbial reduction; Groundwater

KeyWords Plus: ORGANIC-CARBON SOURCES; MICROBIAL REDUCTION; ELECTRON-TRANSFER; CHROMIUM VI; PADDY SOIL; BIOELECTRICITY GENERATION; CONTAMINATED GROUNDWATER; ISOTOPE FRACTIONATION; CHLORINATED PHENOLS; IRON

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标题: Flood susceptibility mapping in Dingnan County (China) using adaptive neuro-fuzzy inference system with biogeography based optimization and imperialistic competitive algorithm

作者: Wang, Y (Wang, Yi); Hong, HY (Hong, Haoyuan); Chen, W (Chen, Wei); Li, SJ (Li, Shaojun); Panahi, M (Panahi, Mahdi); Khosravi, K (Khosravi, Khabat); Shirzadi, A (Shirzadi, Ataollah); Shahabi, H (Shahabi, Himan); Panahi, S (Panahi, Somayeh); Costache, R (Costache, Romulus)

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摘要: Flooding is one of the most significant environmental challenges and can easily cause fatal incidents and economic losses. Flood reduction is costly and time-consuming task; so it is necessary to accurately detect flood susceptible areas. This work presents an effective flood susceptibility mapping framework by involving an adaptive neuro-fuzzy inference system (ANFIS) with two metaheuristic methods of biogeography based optimization (BBO) and imperialistic competitive algorithm (ICA). A total of 13 flood influencing factors, including slope, altitude, aspect, curvature, topographic wetness index, stream power index, sediment transport index, distance to river, landuse, normalized difference vegetation index, lithology, rainfall and soil type, were used in the proposed framework for spatial modeling and Dingnan County in China was selected for the application of the proposed methods due to data availability. There are 115 flood occurrences in the study area which were randomly separated into training (70% of the total) and verification (30%) sets. To perform the proposed framework, the step-wise weight assessment ratio analysis algorithm is first used to evaluate the correlation between influencing factors and floods. Then, two ensemble methods of ANFIS-BBO and ANFIS-ICA are constructed for spatial prediction and producing flood susceptibility maps. Finally, these resultant maps are assessed in terms of several statistical and error measures, including receiver operating characteristic (ROC) curve and area under the ROC curve (AUC), root-mean-square error (RMSE). The experimental results demonstrated that the two ensemble methods were more effective than ANFIS in the study area. For instance, the predictive AUC values of 0.8407, 0.9045 and 0.9044 were achieved by the methods of ANFIS, ANFIS-BBO and ANFIS-ICA, respectively. Moreover, the RMSE values for ANFIS, ANFIS-BBO and ANFIS-ICA using the verification set were 0.3100, 0.2730 and 0.2700, respectively. In addition, as regards ANFIS-BBO and ANFIS-ICA, a total areas of 39.30% and 35.39% were classified as highly susceptible to flooding. Therefore, the proposed ensemble framework can be used for flood susceptibility mapping in other sites with similar geo-environmental characteristics for taking measures to manage and prevent flood damages.

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文献类型: Article

作者关键词: Flood susceptibility mapping; Adaptive neuro-fuzzy inference system; Metaheuristic methods; Biogeography based optimization; Imperialistic competitive algorithm

KeyWords Plus: ARTIFICIAL-INTELLIGENCE APPROACH; DATA MINING TECHNIQUES; WEIGHTS-OF-EVIDENCE; SPATIAL PREDICTION; GENETIC ALGORITHM; DIFFERENTIAL EVOLUTION; STATISTICAL-MODELS; FREQUENCY RATIO; BIVARIATE; ANFIS

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作者: Chen, W (Chen, Wei); Hong, HY (Hong, Haoyuan); Panahi, M (Panahi, Mandi); Shahabi, H (Shahabi, Himan); Wang, Y (Wang, Yi); Shirzadi, A (Shirzadi, Ataollah); Pirasteh, S (Pirasteh, Saied); Alesheikh, AA (Alesheikh, Ali Asghar); Khosravi, K (Khosravi, Khabat); Panahi, S (Panahi, Somayeh); Rezaie, F (Rezaie, Fatemeh); Li, SJ (Li, Shaojun); Jaafari, A (Jaafari, Abolfazl); Bui, DT (Dieu Tien Bui); Bin Ahmad, B (Bin Ahmad, Baharin)

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摘要: The most dangerous landslide disasters always cause serious economic losses and human deaths. The contribution of this work is to present an integrated landslide modelling framework, in which an adaptive neuro-fuzzy inference system (ANFIS) is combined with the two optimization algorithms of whale optimization algorithm (WOA) and grey wolf optimizer (GWO) at Anyuan County, China. It means that WOA and GWO are used as two meta-heuristic algorithms to improve the prediction performance of the ANFIS-based methods. In addition, the step-wise weight assessment ratio analysis (SWARA) method is used to obtain the initial weight of each class of landslide influencing factors. To validate the effectiveness of the proposed framework, 315 landslide events in history were selected for our experiments and were randomly divided into the training and verification sets. To perform landslide susceptibility mapping, fifteen geological, hydrological, geomorphological, land cover, and other factors are considered for the modelling construction. The landslide susceptibility maps by SWARA, SWARA-ANFIS, SWARA-ANFIS-PSO, SWARA-ANFIS-WOA, and SWARA-ANFIS-GWO models are assessed using the measures of the receiver operating characteristic (ROC) curve and root-mean-square error (RMSE). The experiments demonstrated that the obtained results of modelling process from the SWARA to the SAWRA-ANFIS-GWO model were more accurate and that the proposed methods have satisfactory prediction ability. Specifically, prediction accuracy by area under the curve (AUC) of SWARA, SWARA-ANFIS, SWARA-ANFIS-PSO, SWARA-ANFIS-GWO, and SWARA-ANFIS-WOA models were 0.831, 0.831, 0.850, 0.856, and 0.869, respectively. Due to adaptability and usability, the proposed prediction methods can be applied to other areas for landslide management and mitigation as well as prevention throughout the world.

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作者关键词: landslide; evolutionary optimization algorithm; prediction accuracy; goodness-of-fit; machine learning; China

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作者: Garg, S (Garg, Sahil); Kaur, K (Kaur, Kuljeet); Kumar, N (Kumar, Neeraj); Kaddoum, G (Kaddoum, Georges); Zomaya, AY (Zomaya, Albert Y.); Ranjan, R (Ranjan, Rajiv)

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摘要: With the emergence of the Internet-of-Things (IoT) and seamless Internet connectivity, the need to process streaming data on real-time basis has become essential. However, the existing data stream management systems are not efficient in analyzing the network log big data for real-time anomaly detection. Further, the existing anomaly detection approaches are not proficient because they cannot be applied to networks, are computationally complex, and suffer from high false positives. Thus, in this paper a hybrid data processing model for network anomaly detection is proposed that leverages grey wolf optimization (GWO) and convolutional neural network (CNN). To enhance the capabilities of the proposed model, GWO and CNN learning approaches were enhanced with: 1) improved exploration, exploitation, and initial population generation abilities and 2) revamped dropout functionality, respectively. These extended variants are referred to as Improved-GWO (ImGWO) and Improved-CNN (ImCNN). The proposed model works in two phases for efficient network anomaly detection. In the first phase, ImGWO is used for feature selection in order to obtain an optimal trade-off between two objectives, i.e., reduced error rate and feature-set minimization. In the second phase, ImCNN is used for network anomaly classification. The efficacy of the proposed model is validated on benchmark (DARPA'98 and KDD'99) and synthetic datasets. The results obtained demonstrate that the proposed cloud-based anomaly detection model is superior in comparison to the other state-of-the-art models (used for network anomaly detection), in terms of accuracy, detection rate, false positive rate, and F-score. In average, the proposed model exhibits an overall improvement of 8.25%, 4.08%, and 3.62% in terms of detection rate, false positives, and accuracy, respectively; relative to standard GWO with CNN.

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标题: Thinning and destruction of the lithospheric mantle root beneath the North China Craton: A review

作者: Liu, JA (Liu, Jingao); Cai, RH (Cai, Ronghua); Pearson, DG (Pearson, D. Graham); Scott, JM (Scott, James M.)

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摘要: It is widely accepted that the lithosphere beneath the eastern portion of the North China Craton (NCC) has suffered extensive thinning and destruction since the Mesozoic. The driving force for this transformation remains debated, although most models make a first-order link with the evolution of the Paleo-Pacific subduction and the effects of the Pacific slab subduction. In this review, we discuss the temporal and spatial relationships between the Paleo-Pacific and the Pacific slab subduction and the lithospheric thinning/destruction processes experienced by the NCC. We recognize four key stages: 1) an initial stage of low angle flat subduction of the Paleo-Pacific slab between similar to 170-145 Ma, 2) the sinking or rollback of the Paleo-Pacific slab and associated asthenosphere upwelling (145-110 Ma), 3) the disappearance of the Paleo-Pacific slab into lower mantle (110-55 Ma), and 4) the initiation of subduction of the present-day Pacific slab and associated formation of a Big Mantle Wedge (BMW) beneath East Asia ( < 55 Ma).

The initial flat subduction of the Paleo-Pacific plate inhibited mantle-derived magmatism in the period between 170 and 145 Ma beneath the NCC. However, during this stage, intraplate deformation and crustal magmatism migrated westward from craton margin to interior. The cratonic subcontinental lithospheric mantle (SCLM) was further hydrated and metasomatized in addition to that caused by prior circum-cratonic orogenies/subductions. At ca. 155 Ma, the Paleo-Pacific plate began to sink or roll back, causing asthenosphere upwelling and triggering melting of the metasomatized SCLM to form arc-like basalts and low degree melts such as lamprophyres. Vigorous mantle flow/convection transported the metasomatically refertilized and weakened cratonic SCLM into the deep mantle and resulted in the thinning of the lithosphere. At the craton margins, where the lithosphere, thickened by collision, had lost a lower portion of the cratonic SCLM by mantle erosion, de lamination of the eclogitic lower crust and underlying pre-thinned SCLM occurred. Upwelling asthenosphere replaced the detached lithosphere and then cooled by conduction to form new lithospheric mantle. This process may have continued to ca. 125 Ma when mantle-derived melts transitioned from arc-like to OIB-like basalts. Replacement of the mantle lithosphere by asthenosphere elevated the lithospheric geotherm and led to extensive crustal melting and the generation of massive volumes of felsic-intermediate magmatism in the eastern NCC until similar to 110 Ma. After the termination of lithosphere replacement, the speed of subduction of the Paleo-Pacific plate may have increased and by ca. 55 Ma, the whole slab vanished into the lower mantle. We suggest that the subsequent formation of present-day Pacific ocean lithosphere led to a new phase of low angle subduction of the Pacific plate margin. At ca. 35 Ma, the Pacific plate started to descend forming a BMW, accompanied by up welling of asthenosphere and widespread eruption of alkali basalts across eastern China. The ongoing subduction of the Pacific plate may also lead to further lithospheric thinning.

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标题: Metamorphism and the evolution of plate tectonics

作者: Holder, RM (Holder, Robert M.); Viete, DR (Viete, Daniel R.); Brown, M (Brown, Michael); Johnson, TE (Johnson, Tim E.)

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摘要: Earth's mantle convection, which facilitates planetary heat loss, is manifested at the surface as present-day plate tectonics1. When plate tectonics emerged and how it has evolved through time are two of the most fundamental and challenging questions in Earth science(1-4). Metamorphic rocks-rocks that have experienced solid-state mineral transformations due to changes in pressure (P) and temperature (T)-record periods of burial, heating, exhumation and cooling that reflect the tectonic environments in which they formed(5,6). Changes in the global distribution of metamorphic (P, T) conditions in the continental crust through time might therefore reflect the secular evolution of Earth's tectonic processes. On modern Earth, convergent plate margins are characterized by metamorphic rocks that show a bimodal distribution of apparent thermal gradients (temperature change with depth; parameterized here as metamorphic T/P) in the form of paired metamorphic belts(5), which is attributed to metamorphism near (low T/P) and away from (high T/P) subduction zones(5,6). Here we show that Earth's modern plate tectonic regime has developed gradually with secular cooling of the mantle since the Neoarchaean era, 2.5 billion years ago. We evaluate the emergence of bimodal metamorphism (as a proxy for secular change in plate tectonics) using a statistical evaluation of the distributions of metamorphic T/P through time. We find that the distribution of metamorphic T/P has gradually become wider and more distinctly bimodal from the Neoarchaean era to the present day, and the average metamorphic T/P has decreased since the Palaeoproterozoic era. Our results contrast with studies that inferred an abrupt transition in tectonic style in the Neoproterozoic era (about 0.7 billion years ago(1,7,8)) or that suggested that modern plate tectonics has operated since the Palaeoproterozoic era (about two billion years ago(9-12)) at the latest.

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标题: Reactant activation and photocatalysis mechanisms on Bi-metal@Bi2GeO5 with oxygen vacancies: A combined experimental and theoretical investigation

作者: Li, XW (Li, Xinwei); Zhang, WD (Zhang, Wendong); Cui, W (Cui, Wen); Li, JY (Li, Jieyuan); Sun, YJ (Sun, Yanjuan); Jiang, GM (Jiang, Guangming); Huang, HW (Huang, Hongwei); Zhang, YX (Zhang, Yuxin); Dong, F (Dong, Fan)

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摘要: The photocatalysis process follows two fundamental sequences: reactant adsorption and surface photocatalysis. In this work, Bi metal-deposited Bi2GeO5 (Bi@BiGeO) is prepared as a model photocatalyst to understand the adsorption and activation mechanisms of the reactants and the photocatalytic oxidation of NO under visible light irradiation. Density functional theory and analytical approaches are employed to reveal the electronic structure and photo-induced carrier transfer processes. The introduction of Bi metal and the generation of oxygen vacancies (OVs) in BiGeO were achieved simultaneously via a facile method. The Bi metal served as a visible light antenna and as an electron sink and promoted the carrier separation and transfer. The OVs promote reactant (H2O and O-2) activation, thereby reinforcing the generation of reactive oxygen species (ROS). The NO molecules are actively adsorbed at the coordinative unsaturated sites on Bi@BiGeO and get activated via electron exchange. The photocatalytic NO oxidation mechanism on Bi@BiGeO is revealed based on the reaction intermediates and final products monitored using in-situ FTIR. This work highlights the importance of reactant activation as a new strategy for the design of highly efficient photocatalysts to overcome the bottlenecks in environmental applications.

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作者关键词: Heterogeneous photocatalysis; Reactant activation; Bismuth germanate oxide; Bi metal; Oxygen vacancies; In-situ FTIR

KeyWords Plus: BISMUTH NANOPARTICLES; CHARGE SEPARATION; NO2 ADSORPTION; OXIDATION; TIO2; METAL; WATER; REMOVAL; G-C3N4; FTIR

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标题: Flood susceptibility modelling using novel hybrid approach of reduced-error pruning trees with bagging and random subspace ensembles

作者: Chen, W (Chen, Wei); Hong, HY (Hong, Haoyuan); Li, SJ (Li, Shaojun); Shahabi, H (Shahabi, Himan); Wang, Y (Wang, Yi); Wang, XJ (Wang, Xiaojing); Bin Ahmad, B (Bin Ahmad, Baharin)

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摘要: Flooding is a very common natural hazard that causes catastrophic effects worldwide. Recently, ensemble-based techniques have become popular in flood susceptibility modelling due to their greater strength and efficiency in the prediction of flood locations. Thus, the aim of this study was to employ machine learning-based Reduced-error pruning trees (REPTree) with Bagging (Bag-REPTree) and Random subspace (RS-REPTree) ensemble frameworks for spatial prediction of flood susceptibility using a geographic information system (GIS). First, a flood spatial database was constructed with 363 flood locations and thirteen flood influencing factors, namely altitude, slope angle, slope aspect, curvature, stream power index (SPI), sediment transport index (STI), topographic wetness index (TWI), distance to rivers, normalized difference vegetation index (NDVI), soil, land use, lithology, and rainfall. Subsequently, correlation attribute evaluation (CAE) was used as the factor selection method for optimization of input factors. Finally, the receiver operating characteristic (ROC) curve, standard error (SE), confidence interval (CI) at 95%, and Wilcoxon signed-rank test were used to validate and compare the performance of the models. Results show that the RS-REPTree model has the highest prediction capability for flood susceptibility assessment, with the highest area under (the ROC) curve (AUC) value (0.949, 0.907), the smallest SE (0.011, 0.023), and the narrowest CI (95%) (0.928-0.970, 0.863-0.952) for the training and validation datasets. It was followed by the Bag-REPTree and REPTree models, respectively. The results also proved the superiority of the ensemble method over using these methods individually.

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标题: The Role of Polarization in Photocatalysis

作者: Chen, F (Chen, Fang); Huang, HW (Huang, Hongwei); Guo, L (Guo, Lin); Zhang, YH (Zhang, Yihe); Ma, TY (Ma, Tianyi)

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摘要: Semiconductor photocatalysis as a desirable technology shows great potential in environmental remediation and renewable energy generation, but its efficiency is severely restricted by the rapid recombination of charge carriers in the bulk phase and on the surface of photocatalysts. Polarization has emerged as one of the most effective strategies for addressing the above-mentioned issues, thus effectively promoting photocatalysis. This review summarizes the recent advances on improvements of photocatalytic activity by polarization-promoted bulk and surface charge separation. Highlighted is the recent progress in charge separation advanced by different types of polarization, such as macroscopic polarization, piezoelectric polarization, ferroelectric polarization, and surface polarization, and the related mechanisms. Finally, the strategies and challenges for polarization enhancement to further enhance charge separation and photocatalysis are discussed.

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语言: English

文献类型: Review

作者关键词: charge separation; oxidation; photocatalysis; semiconductors; surface chemistry

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标题: New Particle Formation in the Atmosphere: From Molecular Clusters to Global Climate

作者: Lee, SH (Lee, Shan-Hu); Gordon, H (Gordon, Hamish); Yu, H (Yu, Huan); Lehtipalo, K (Lehtipalo, Katrianne); Haley, R (Haley, Ryan); Li, YX (Li, Yixin); Zhang, RY (Zhang, Renyi)

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摘要: New particle formation (NPF) represents the first step in the complex processes leading to formation of cloud condensation nuclei. Newly formed nanoparticles affect human health, air quality, weather, and climate. This review provides a brief history, synthesizes recent significant progresses, and outlines the challenges and future directions for research relevant to NPF. New developments include the emergence of state-of-the-art instruments that measure prenucleation clusters and newly nucleated nanoparticles down to about 1 nm; systematic laboratory studies of multicomponent nucleation systems, including collaborative experiments conducted in the Cosmics Leaving Outdoor Droplets chamber at CERN; observations of NPF in different types of forests, extremely polluted urban locations, coastal sites, polar regions, and high-elevation sites; and improved nucleation theories and parameterizations to account for NPF in atmospheric models. The challenges include the lack of understanding of the fundamental chemical mechanisms responsible for aerosol nucleation and growth under diverse environments, the effects of SO2 and NOx on NPF, and the contribution of anthropogenic organic compounds to NPF. It is also critical to develop instruments that can detect chemical composition of particles from 3 to 20 nm and improve parameterizations to represent NPF over a wide range of atmospheric conditions of chemical precursor, temperature, and humidity.

Plain Language Summary In the atmosphere, invisible to the human eye, there are many microscopic particles, or nanoparticles, that affect human health, air quality, and climate. We do not fully understand the chemical processes that allow these fine particles to form and be suspended in the air nor how they influence heat flow in Earth's atmosphere. Laboratory experiments, field observations, and modeling simulations have all shown different results for how these particles behave. These inconsistencies make it difficult to accurately represent the processes of new particle formation in regional and global atmospheric models. Scientists still need to develop instruments that can measure the smallest range of nanoparticles and to find ways to describe particle formation that allow for differences in temperature, humidity, and level of pollution.

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语言: English

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作者关键词: new particle formation; nucleation and growth; CCN; sulfuric acid; ammonia; HOMs

KeyWords Plus: ION-INDUCED NUCLEATION; NUMBER SIZE DISTRIBUTIONS; IONIZATION MASS-SPECTROMETER; CLOUD-CONDENSATION NUCLEI; BINARY HOMOGENEOUS NUCLEATION; SECONDARY ORGANIC AEROSOL; YANGTZE-RIVER DELTA; DIFFERENTIAL MOBILITY ANALYZER; SULFURIC-ACID CONCENTRATION; CHEMICAL-TRANSPORT MODEL

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作者: Li, M (Li, Min); Yu, SX (Yu, Shixin); Huang, HW (Huang, Hongwei); Li, XW (Li, Xiaowei); Feng, YB (Feng, Yibo); Wang, C (Wang, Cong); Wang, YG (Wang, Yonggang); Ma, TY (Ma, Tianyi); Guo, L (Guo, Lin); Zhang, YH (Zhang, Yihe)

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摘要: Exposure of anisotropic crystal facets allows the directional transfer of photoexcited electrons (e(-)) and holes (h(+)), for spatial charge separation. High-index facets with a high density of low-coordinated atoms always serve as reactive catalytic sites. However, preparation of multi-facets or high-index facets is highly challenging for layered bismuth-based photocatalysts. Herein, we report the preparation of unprecedented eighteen-faceted BiOCl with {001} top facets and {102} and {112} oblique facets via a hydrothermal process. Compared to the conventional BiOCl square plates with {001} top facets and {110} lateral facets, the eighteen-faceted BiOCl has highly enhanced photocatalytic activity for H-2 evolution and hydroxyl radicals ((OH)-O-.) production. Theoretical calculations and photodeposition results disclose that the of eighteen-faceted BiOCl has a well-matched {001}/{102}/{112} ternary facet junction, which provides a cascade path for more efficient charge flow than the binary facet junction in BiOCl square plates.

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文献类型: Article

作者关键词: bismuth; facet junctions; hydrogen production; hydroxyl radicals evolution; photocatalysis

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标题: The accuracy and efficiency of GA and PSO optimization schemes on estimating reaction kinetic parameters of biomass pyrolysis

作者: Ding, YM (Ding, Yanming); Zhang, WL (Zhang, Wenlong); Yu, L (Yu, Lei); Lu, KH (Lu, Kaihua)

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摘要: Reaction kinetic parameters estimation of biomass pyrolysis is a relatively difficult optimization problem due to the complexity of pyrolysis model. Two common heuristic algorithms, Genetic Algorithm (GA) and Particle Swarm Optimization (PSO), are applied to estimate the kinetic parameters of three-component parallel reaction mechanism based on the thermogravimetric experiment in wide heating rates. The accuracy and efficiency of GA and PSO algorithms are compared with each other under the identical optimization conditions. The results indicate the better optimization abilities of PSO with the closer convergence solution to the global optimum and quicker convergence to the solution than GA based on the three-component parallel reaction mechanism of biomass pyrolysis. Especially, the improvement of best fitting value of PSO reaches up to 30% compared with that of GA. Furthermore, 14 estimated kinetic parameters of best fitting value are obtained and the mass loss rate predicted results including three separate components (hemicellulose, cellulose and lignin) are compared with experimental data. (C) 2019 Elsevier Ltd. All rights reserved.

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作者关键词: Biomass pyrolysis; Kinetic parameters; Optimization scheme; GA; PSO

KeyWords Plus: PARTICLE SWARM OPTIMIZATION; BENCH-SCALE PYROLYSIS; GENETIC ALGORITHM; LIGNOCELLULOSIC BIOMASS; THERMAL-DECOMPOSITION; BEHAVIOR; MODEL

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标题: Surface-Halogenation-Induced Atomic-Site Activation and Local Charge Separation for Superb CO2 Photoreduction

作者: Hao, L (Hao, Lin); Kang, L (Kang, Lei); Huang, HW (Huang, Hongwei); Ye, LQ (Ye, Liqun); Han, KL (Han, Keli); Yang, SQ (Yang, Songqiu); Yu, HJ (Yu, Hongjian); Batmunkh, M (Batmunkh, Munkhbayar); Zhang, YH (Zhang, Yihe); Ma, TY (Ma, Tianyi)

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摘要: Solar-energy-driven CO2 conversion into value-added chemical fuels holds great potential in renewable energy generation. However, the rapid recombination of charge carriers and deficient reactive sites, as two major obstacles, severely hampers the photocatalytic CO2 reduction activity. Herein, a desirable surface halogenation strategy to address the aforementioned concerns over a Sillen-related layer-structured photocatalyst Bi2O2(OH)(NO3) (BON) is demonstrated. The surface halogen ions that are anchored on the Bi atoms by replacing surface hydroxyls on the one hand facilitate the local charge separation, and, on the other hand, activate the hydroxyls that profoundly boost the adsorption of CO2 molecules and protons and facilitate the CO2 conversion process, as evidenced by experimental and theoretical results collectively. Among the three series of BON-X (X = Cl, Br, and I) catalysts, BON-Br shows the most substantially enhanced CO production rate (8.12 mu mol g(-1) h(-1)) without any sacrificial agents or cocatalysts, approximate to 73 times higher than that of pristine Bi2O2(OH)(NO3), also exceeding that of the state-of-the-art photocatalysts reported to date. This work presents a surface polarization protocol for engineering charge behavior and reactive sites to promote photocatalysis, which shows great promise to the future design of high-performance materials for clean energy production.

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标题: Defining the morphological quality of fossil footprints. Problems and principles of preservation in tetrapod ichnology with examples from the Palaeozoic to the present

作者: Marchetti, L (Marchetti, Lorenzo); Belvedere, M (Belvedere, Matteo); Voigt, S (Voigt, Sebastian); Klein, H (Klein, Hendrik); Castanera, D (Castanera, Diego); Diaz-Martinez, I (Diaz-Martinez, Ignacio); Marty, D (Marty, Daniel); Xing, LD (Xing, Lida); Feola, S (Feola, Silverio); Melchor, RN (Melchor, Ricardo N.); Farlow, JO (Farlow, James O.)

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摘要: The morphology of fossil footprints is the basis of vertebrate footprint ichnology. However, the processes acting during and after trace fossil registration which are responsible for the final morphology have never been precisely defined, resulting in a dearth of nomenclature. Therefore, we discuss the concepts of ichnotaphonomy, ichnostratinomy, taphonomy, biostratinomy, registration and diagenesis and describe the processes acting on footprint morphology. In order to evaluate the morphological quality of tetrapod footprints, we introduce the concept of morphological preservation, which is related to the morphological quality of footprints (M-preservation, acronym MP), and distinguish it from physical preservation (P-preservation, acronym PP), which characterizes whether or not a track is eliminated by taphonomic and diagenetic processes. M-preservation includes all the morphological features produced during and after track registration prior to its study, and may be divided into substages (ichnostratinomic, registrational, taphonomic, stratinomic, diagenetic). Moreover, we propose an updated numerical preservation scale for M-preservation. It ranges from 0.0 (worst preservation) to 3.0 (best preservation); intermediate values may be used and specific features may be indicated by letters. In vertebrate footprint ichnotaxonomy, we regard the anatomy-consistent morphology and to a lesser extent the trackway pattern as the only acceptable ichnotaxobases. Only footprints showing a good morphological preservation (grade 2.0-3.0) are useful in ichnotaxonomy, whereas ichnotaxa based on poor morphological preservation (grade 0.0-1.5) are considered ichnotaphotaxa (nomina dubia) characterized by extramorphologies. We applied the preservation scale on examples from the Palaeozoic to the present time, including three ichnotaphotaxa and 18 anatomy-consistent ichnotaxa/morphotypes attributed to several vertebrate footprint producers. Results indicate the utility, feasibility and suitability of this method for the entire vertebrate footprint record in any lithofacies, strongly recommending its use in future ichnotaxonomic studies.

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KeyWords Plus: NORTHERN EBRO BASIN; TRACE FOSSILS; SOUTHERN ALPS; LA RIOJA; VERTEBRATE FOOTPRINTS; BOTUCATU FORMATION; JIAGUAN FORMATION; LATE PLEISTOCENE; NW SWITZERLAND; CAMEROS BASIN

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作者: Muller, RD (Muller, R. Dietmar); Zahirovic, S (Zahirovic, Sabin); Williams, SE (Williams, Simon E.); Cannon, J (Cannon, John); Seton, M (Seton, Maria); Bower, DJ (Bower, Dan J.); Tetley, MG (Tetley, Michael G.); Heine, C (Heine, Christian); Le Breton, E (Le Breton, Eline); Liu, SF (Liu, Shaofeng); Russell, SHJ (Russell, Samuel H. J.); Yang, T (Yang, Ting); Leonard, J (Leonard, Jonathon); Gurnis, M (Gurnis, Michael)

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摘要: Global deep-time plate motion models have traditionally followed a classical rigid plate approach, even though plate deformation is known to be significant. Here we present a global Mesozoic-Cenozoic deforming plate motion model that captures the progressive extension of all continental margins since the initiation of rifting within Pangea at similar to 240 Ma. The model also includes major failed continental rifts and compressional deformation along collision zones. The outlines and timing of regional deformation episodes are reconstructed from a wealth of published regional tectonic models and associated geological and geophysical data. We reconstruct absolute plate motions in a mantle reference frame with a joint global inversion using hot spot tracks for the last 80 million years and minimizing global trench migration velocities and net lithospheric rotation. In our optimized model, net rotation is consistently below 0.2 degrees/Myr, and trench migration scatter is substantially reduced. Distributed plate deformation reaches a Mesozoic peak of 30 x 10(6) km(2) in the Late Jurassic (similar to 160-155 Ma), driven by a vast network of rift systems. After a mid-Cretaceous drop in deformation, it reaches a high of 48 x 10(6) km(2) in the Late Eocene (similar to 35 Ma), driven by the progressive growth of plate collisions and the formation of new rift systems. About a third of the continental crustal area has been deformed since 240 Ma, partitioned roughly into 65% extension and 35% compression. This community plate model provides a framework for building detailed regional deforming plate networks and form a constraint for models of basin evolution and the plate-mantle system.

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标题: Comparison of convolutional neural networks for landslide susceptibility mapping in Yanshan County, China

作者: Wang, Y (Wang, Yi); Fang, ZC (Fang, Zhice); Hong, HY (Hong, Haoyuan)

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摘要: Assessments of landslide disasters are becoming increasingly urgent. The aim of this study is to investigate a convolutional neural network (CNN) framework for landslide susceptibility mapping (LSM) in Yanshan County, China. The two primary contributions of this study arc summarized as follows. First. W the best of our knowledge, this report describes the first time that the CNN framework is used for LSM.Second, different data representation algorithms arc developed to construct three novel CNN architectures. In this work, sixteen influencing factors associated with landslide occurrence were considered and historical landslide locations were randomly divided into training (70% of the total) and validation (30%) sets. Validation of these CNNs was performed using different commonly used measures in comparison to several of the most popular machine learning and deep learning methods. The experimental results demonstrated that the proportions of highly susceptible zones in all of the CNN landslide susceptibility maps are highly similar and lower than 30%, which indicates that these CNNs are more practical for landslide prevention and management than conventional methods. Furthermore, the proposed CNN framework achieved higher or comparable prediction accuracy. Specifically, the proposed CNNs were 3.94%-7.45% and 0.079-0.151 higher than those of the optimized support vector machine (SVM) in terms of overall accuracy (OA) and Matthews correlation coefficient (MCC), respectively. (C) 2019 Elsevier B.V. All rights reserved.

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作者: Long, ZX (Long, Zouxia); Pan, Z (Pan, Zhong); Wang, WL (Wang, Wenling); Ren, JY (Ren, Jianye); Yu, XG (Yu, Xingguang); Lin, LY (Lin, Liangyu); Lin, H (Lin, Hui); Chen, HZ (Chen, Hongzhe); Jin, XL (Jin, Xianglong)

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摘要: Studying the abundance, characteristics, and removal of microplastics (MPs) in wastewater treatment plants (WWTPs) in coastal cities is of great significance for understanding the impacts of human activities on the marine environment, but currently, little information on this topic is available in China. Therefore, the abundance, characteristics, and removal of MPs in seven WWTPs of Xiamen, a typical coastal city in China, are studied. Sixty samples were collected using an improved sampling method involving an electromagnetic flowmeter and a fast digital camera. The influent MN concentration is 1.57-13.69 items/L, and it is reduced to 0.20-1.73 items/L in the effluent, indicating that 79.3-97.8% MPs is removed. Based on the daily effluent discharge and MPs removal rate, it is estimated that similar to 6.5 x 10(8) MPs are released from the seven WWTPs into the Xiamen Bay each day. The light microscopic and micro-Raman spectroscopic analysis indicates that similar to 62.68% of particles are plastic polymers, including polypropylene (31.6%), polyethylene (21.9%), polystyrene (10.1%), propylene/ethylene copolymer (9.2%), and polyethylene terephthalate (7.5%). The color of MPs is mainly composed of white (27.3%) and clears (25.8%). Our results show that granules (41.1%) are the dominant shape of MPs, followed by fragments (31.3%), fibers (23.7%), and pellet (3.9%). The characteristics of MPs such as sizes, shapes, and types affect the MPs removal in WWTPs. Our findings show that MPs concentration in the influent is positively correlated with the suspended solids (SS), however, in the effluent, it is associated with the WWTPs operating load, as reflected by obviously higher MP abundance in overloaded ones. (C) 2019 Elsevier Ltd. All rights reserved.

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作者: Helbich, M (Helbich, Marco); Yao, Y (Yao, Yao); Liu, Y (Liu, Ye); Zhang, JB (Zhang, Jinbao); Liu, PH (Liu, Penghua); Wang, RY (Wang, Ruoyu)

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摘要: Background: Residential green and blue spaces may be therapeutic for the mental health. However, solid evidence on the linkage between exposure to green and blue spaces and mental health among the elderly in non-Western countries is scarce and limited to exposure metrics based on remote sensing images (i.e., land cover and vegetation indices). Such overhead-view measures may fail to capture how people perceive the environment on the site.

Objective: This study aimed to compare streetscape metrics derived from street view images with satellite-derived ones for the assessment of green and blue space; and to examine associations between exposure to green and blue spaces as well as geriatric depression in Beijing, China.

Methods: Questionnaire data on 1190 participants aged 60 or above were analyzed cross-sectionally. Depressive symptoms were assessed through the shortened Geriatric Depression Scale (GDS-15). Streetscape green and blue spaces were extracted from Tencent Street View data by a fully convolutional neural network. Indicators derived from street view images were compared with a satellite-based normalized difference vegetation index (NDVI), a normalized difference water index (NDWI), and those derived from GlobeLand30 land cover data on a neighborhood level. Multilevel regressions with neighborhood-level random effects were fitted to assess correlations between GDS-15 scores and these green and blue spaces exposure metrics.

Results: The average cumulative GDS-15 score was 3.4 (i.e., no depressive symptoms). Metrics of green and blue space derived from street view images were not correlated with satellite-based ones. While NDVI was highly correlated with GlobeLand30 green space, NDWI was moderately correlated with GlobeLand30 blue space. Multilevel regressions showed that both street view green and blue spaces were inversely associated with GDS-15 scores and achieved the highest model goodness-of-fit. No significant associations were found with NDVI, NDWI, and GlobeLand30 green and blue space. Our results passed robustness tests.

Conclusion: Our findings provide support that street view green and blue spaces are protective against depression for the elderly in China, yet longitudinal confirmation to infer causality is necessary. Street view and satellite-derived green and blue space measures represent different aspects of natural environments. Both street view data and deep learning are valuable tools for automated environmental exposure assessments for health-related studies.

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作者: Li, SZ (Li, Sanzhong); Suo, YH (Suo, Yanhui); Li, XY (Li, Xiyao); Zho, J (Zho, Jie); Santosh, M (Santosh, M.); Wang, PC (Wang, Pengcheng); Wang, GZ (Wang, Guangzeng); Guo, LL (Guo, Lingli); Yu, SY (Yu, Shengyao); Lan, HY (Lan, Haoyuan); Dai, LM (Dai, Liming); Zhou, ZZ (Zhou, Zaizhen); Cao, XZ (Cao, Xianzhi); Zhu, JJ (Zhu, Junjiang); Liu, B (Liu, Bo); Jiang, SH (Jiang, Suhua); Wang, G (Wang, Gang); Zhang, GW (Zhang, Guowei)

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摘要: The Mesozoic Western Pacific subduction system significantly impacted the North China and South China blocks along the East Asian continental margin and influenced the tectonic, magmatic, metallogenic and geomorphic evolution of the region. However, the dynamics and impact on the zone along the East Asian ocean-continent connection zone remain debated. Here we provide a comprehensive synthesis of the state-of-the-art information from deformation analysis, magmatism, geochronology, tomography and other fields from this region. We evaluate first the pre-Yanshanian (pre-Jurassic) final assembly of blocks and the Late Triassic formation of the unified continental margin in East China. We then focus on the Jurassic and Cretaceous geological processes in the East Asian ocean-continent connection zone. The temporal and spatial evolution of structural propagation, sedimentary depocentre, age zonation and migration of magrnatism, as well as the large-scale tectono-morphological inversion in the Earth surface system combined with deep processes, are probed. In the early Yanshannian Period (Early and Middle Jurassic, 200-160 Ma), the destruction of the North China Craton (NCC) was mainly affected by the westward early-stage layered rollback, and stepwise delamination and thinning of its continental lithosphere, resulting in the early Yanshanian westward migration of tectonism and magmatism.

Coevally, the combined effect of the closure of the Mongal-Okhotsk Ocean to the north and the subduction of the Bangong-Co- Nujiang Ocean to the south imparted an overall compressional setting in the East Asian OceanContinent Connection Zone (EAOCCZ). The centres of asthenospheric upwelling and mantle extrusion at depth continued to migrate eastward, driving the eastward lithospheric thinning with periodic and alternating extension and compression. The South China Block experienced a westward flat subduction during the early Yanshanian Period, resulting in the westward propagation of deformation and magmatism, followed by late twostage delamination to induce the eastward tectono-magmatism. The difference in tectono-magmatic styles between the North China and South China blocks is a result of the different mechanisms and syles of the deep delamination processes under the superconvergence regime of the East Asian and adjacent plates. Especially delamination under North China generated the northwestward layered and fractured subcontinental lithospheric mantle, whereas under the eastern South China Block, were the oceanic lithospheric mantle of the Paleo- Pacific Plate that underwent flat subduction, or continental garnet peridotite mantle. In the middle Yanshanian Period (Late Jurassic to early Early Cretaceous, 160-125 Ma), the EAOCCZ underwent escape tectonics to form some basins related to strike slip faulting. Generally the extensional basins in the tails of the triangular-shaped escape blocks are perpendicular to the extrusion direction. The transtensional or transpressional basins are controlled by the strike slip faults distributed on both sides of the triangular block, and the flexural basins occur in front. In the late Yanshanian Period (late Early Cretaceous-Late Cretaceous, 125-65 Ma), the Paleo-Pacific (Izanagi) Plate subducted NNW-ward beneath the Eurasian continent, and the subduction angles changed gradually following eastward mantle extrusion induced by the closure of the Okhotsk Ocean to the north and Bangong-Nujiang Ocean to the south, as well as the rollback and subduction retreat of the Paleo-Pacific Plate to the east. The EAOCCZ gradually experienced lithospheric collapse and the formation of metamorphic core complexes, as well as obvious landscape reversal. During 70-45 Ma, the Izanagi-Pacific Ridge subducted beneath the EAOCCZ to induce wide uplift resulting in the formation of the Cenozoic dextral transtension-related basins.

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摘要: This paper investigates the problem of stability and stabilization of a class of chaotic system through the use of sampled-data control. By employing a Takagi-Sugeno (T-S) fuzzy model to describe the chaotic system and using a time-dependent Lyapunov function, an exponential stability condition is derived for the resulting closed-loop systems with input saturation constraint. Based on this condition, a fuzzy sampled-data controller is designed to stabilize the systems under consideration. The results obtained in this paper are based on the actual characteristic of sampling model. They depend explicitly on both the upper and lower bounds of sampling intervals. The chaotic Lorenz system is considered and solved by using the proposed approach so as to demonstrate the benefits and the superiority of the proposed approach over existing methods. (C) 2019 Elsevier Inc. All rights reserved.

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摘要: Rapid industrialization leads to increased wastewater discharge encompassing hexavalent chromium (Cr(VI)), which leads to serious environmental problems of toxicity and potential carcinogenicity. Removal of these species is normally carried out by ion-exchange, precipitation, membrane filtration, sorption, photocatalytic reduction, etc. This review mainly focuses on the photocatalytic and photoelectrocatalytic (PEC) reduction of Cr (VI), because of their advantages over other methods such as reduced risk of secondary pollution by non-reduced Cr (VI), no sludge formation, no need for a large amount of chemical reagents, clean and easy installation. The main factors influencing the photocatalytic reduction efficiency of Cr (VI) such as catalyst activity, solution pH, Cr adsorption on the catalyst and additives, are briefly discussed. Finally, a special emphasis is provided to the photoelectrocatalytic (PEC) reduction of Cr (VI).

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语言: English

文献类型: Article

作者关键词: Chromium removal; Photocatalytic reduction; Photoelectrocatalytic reduction

KeyWords Plus: ENVIRONMENTAL-POLLUTANT CR(VI); ION-EXCHANGE-RESINS; HEXAVALENT CHROMIUM; WASTE-WATER; AQUEOUS-SOLUTIONS; PHOTOCATHODIC PROTECTION; HEAVY-METALS; PHOTOELECTROCATALYTIC REDUCTION; POLYANILINE COMPOSITE; DOPED TIO2

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标题: Deep learning and its application in geochemical mapping

作者: Zuo, RG (Zuo, Renguang); Xiong, YH (Xiong, Yihui); Wang, J (Wang, Jian); Carranza, EJM (Carranza, Emmanuel John M.)

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摘要: Machine learning algorithms have been applied widely in the fields of natural science, social science and engineering. It can be expected that machine learning approaches especially deep learning algorithms will help geoscientists to discover mineral deposits through processing of various geoscience datasets. This study reviews the state-of-the-art application of deep learning algorithms for processing geochemical exploration data and mining the geochemical patterns. Deep learning algorithms can deal with complex and nonlinear problems and, therefore, can enhance the identification of geochemical anomalies and the recognition of hidden patterns. Applied geochemistry needs more applications of machine learning and/or deep learning algorithms.

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文献类型: Review

作者关键词: Applied geochemistry; Geochemical mapping; Geochemical patterns; Machine learning; Deep learning

KeyWords Plus: PRINCIPAL COMPONENT ANALYSIS; UNDISCOVERED MINERAL-DEPOSITS; RESTRICTED BOLTZMANN MACHINE; PORPHYRY-CU MINERALIZATION; ARTIFICIAL NEURAL-NETWORKS; BIG DATA ANALYTICS; ONE-CLASS SVM; ANOMALY DETECTION; PROSPECTIVITY ANALYSIS; COMPOSITIONAL DATA

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标题: Analysis of transmission dynamics for Zika virus on networks

作者: Li, L (Li, Li); Zhang, J (Zhang, Jie); Liu, C (Liu, Chen); Zhang, HT (Zhang, Hong-Tao); Wang, Y (Wang, Yi); Wang, Z (Wang, Zhen)

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摘要: Transmission of Zika virus (ZIKV) is a serious problem in public health, which can make the babies suffer from microcephaly if their mothers are infected by ZIKV during pregnancy. In this paper, we develop a model of ZIKV transmission in Colombia on complex networks which considers both sexual transmission among humans and the transmission by an infective vector in the process of propagation. We estimate the basic reproduction number R-0 and prove that the disease-free equilibrium is globally asymptotically stable when R-0 < 1. In addition, we study the effects of sexual transmission and the transmission route by an infective vector on the process of propagation. Invasion regions of ZIKV were shown in two-parameters space. The obtained results may provide new insights for the control of ZIKV. (C) 2018 Published by Elsevier Inc.

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语言: English

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作者关键词: ZIKV; Complex networks; Basic reproduction number; Disease control

KeyWords Plus: EPIDEMIC; VECTOR; MODELS

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标题: Parameter extraction of photovoltaic models using an improved teaching-learning-based optimization

作者: Li, SJ (Li, Shuijia); Gong, WY (Gong, Wenyin); Yan, XS (Yan, Xuesong); Hu, CY (Hu, Chengyu); Bai, DY (Bai, Danyu); Wang, L (Wang, Ling); Gao, L (Gao, Liang)

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摘要: Accurate and reliable parameter extraction of photovoltaic (PV) models is urgently desired for the simulation, evaluation, control, and optimization of PV systems. Although many meta-heuristic algorithms have been used to extract the PV parameters, the extracted parameters are usually not very accurate and reliable. To accurately and reliably extract the parameters of different PV models, an improved teaching-learning-based optimization (ITLBO) algorithm is proposed in this paper. The novelty of ITLBO lies primarily in the improved teaching and learning strategies with two improvements: (i) the teacher adopts different teaching strategies according to learner levels in the teacher phase; and (ii) in the learner phase, a new learning strategy is proposed to balance exploration and exploitation. The performance of ITLBO is verified by extracting the parameters of the single diode model, the double diode model, and three PV modules. The experimental results indicate that ITLBO obtains better performance with respect to accuracy and reliability compared to the other algorithms.

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语言: English

文献类型: Article

作者关键词: Photovoltaic models; Parameter extraction; Teaching-learning-based optimization

KeyWords Plus: ARTIFICIAL BEE COLONY; SOLAR-CELL; SWARM OPTIMIZATION; IDENTIFICATION; ALGORITHM; DIODE

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标题: Finite-time synchronization of memristor chaotic systems and its application in image encryption

作者: Wang, LM (Wang, Leimin); Dong, TD (Dong, Tiandu); Ge, MF (Ge, Ming-Feng)

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摘要: This paper investigates the finite-time synchronization of memristor chaotic systems (MCSs). First, an emulator circuit of memristor is designed to implement the MCSs. Then, based on the presented emulator circuit, the model of the MCSs is provided and its finite-time synchronization problem is successfully achieved under the proposed controller. Thereafter, the stability analysis of the closed-loop dynamics is derived and the effectiveness of the theoretical results is testified via numerical simulations. Finally, an image encryption algorithm is proposed based on MCSs. The statistical performance analysis reflects the effectiveness of the image encryption algorithm and shows its potential applications in secure communication. (C) 2018 Elsevier Inc. All rights reserved.

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作者关键词: Finite-time synchronization; Memristor chaotic systems; Memristor emulator circuit; Image encryption

KeyWords Plus: H-INFINITY CONTROL; CONSENSUS; COMMUNICATION; PARAMETERS; NETWORKS; FEEDBACK; NOISE

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标题: Bifurcation analysis of two disc dynamos with viscous friction and multiple time delays

作者: Wei, ZC (Wei, Zhouchao); Zhu, B (Zhu, Bin); Yang, J (Yang, Jing); Perc, M (Perc, Matjaz); Slavinec, M (Slavinec, Mitja)

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摘要: The impact of multiple time delays on the dynamics of two disc dynamos with viscous friction is studied in this paper. We consider the stability of equilibrium states for different delay values, and determine the location of relevant Hopf bifurcations using the normal form method and the center manifold theory. By performing numerical calculations and analysis, we verify the validity of our analytically obtained results. Our research results reveal a classical period-doubling route towards deterministic chaos in the studied system, and play an important role for the better understanding of the complex dynamics of two disc dynamos with viscous friction subject to multiple time delays. (C) 2018 Elsevier Inc. All rights reserved.

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标题: Evidence for a prolonged Permian-Triassic extinction interval from global marine mercury records

作者: Shen, J (Shen, Jun); Chen, JB (Chen, Jiubin); Algeo, TJ (Algeo, Thomas J.); Yuan, SL (Yuan, Shengliu); Feng, QL (Feng, Qinglai); Yu, JX (Yu, Jianxin); Zhou, L (Zhou, Lian); O'Connell, B (O'Connell, Brennan); Planavsky, NJ (Planavsky, Noah J.)

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摘要: The latest Permian mass extinction, the most devastating biocrisis of the Phanerozoic, has been widely attributed to eruptions of the Siberian Traps Large Igneous Province, although evidence of a direct link has been scant to date. Here, we measure mercury (Hg), assumed to reflect shifts in volcanic activity, across the Permian-Triassic boundary in ten marine sections across the Northern Hemisphere. Hg concentration peaks close to the Permian-Triassic boundary suggest coupling of biotic extinction and increased volcanic activity. Additionally, Hg isotopic data for a subset of these sections provide evidence for largely atmospheric rather than terrestrial Hg sources, further linking Hg enrichment to increased volcanic activity. Hg peaks in shallow-water sections were nearly synchronous with the end-Permian extinction horizon, while those in deep-water sections occurred tens of thousands of years before the main extinction, possibly supporting a globally diachronous biotic turnover and protracted mass extinction event.

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语言: English

文献类型: Article

KeyWords Plus: MASS EXTINCTION; SOUTH CHINA; ISOTOPIC COMPOSITION; CARBON-CYCLE; END; BOUNDARY; VOLCANISM; CRISIS; HG; PERTURBATIONS

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标题: Mechanisms of shale gas adsorption: Evidence from thermodynamics and kinetics study of methane adsorption on shale

作者: Chen, L (Chen, Lei); Zuo, L (Zuo, Luo); Jiang, ZX (Jiang, Zhenxue); Jiang, S (Jiang, Shu); Liu, KY (Liu, Keyu); Tan, JQ (Tan, Jingqiang); Zhang, LC (Zhang, Luchuan)

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摘要: Studies on the mechanisms of shale gas adsorption are of great significance for shale gas accumulation and reserves evaluation. In order to investigate the mechanisms of shale gas adsorption from the perspective of methane adsorption thermodynamics and kinetics, high-pressure methane adsorption and adsorption kinetics experiments were measured at 40.6 degrees C, 60.6 degrees C, 75.6 degrees C and 95.6 degrees C at pressures up to 52 MPa for the Lower Silurian Longmaxi shale sample collected from the Southern Sichuan Basin, China. The adsorption isotherms and kinetics curves of methane were obtained and a detailed analysis was performed. The results indicate that (1) Under the condition of 0-52 MPa, the absolute adsorption isotherm of methane on shale has the characteristics of type I adsorption isotherm. Temperature has an important effect on the maximum excess and absolute adsorption of methane. At the same temperature, the absolute adsorption amount of methane on shale increases slower at a higher pressure, which suggests that the methane adsorption rate decreases at a higher pressure. (2) The average isosteric heat of adsorption of methane on shale is 21.06 kJ/mol, indicating that the dominant adsorption process of methane on shale may be physical adsorption. The isosteric heat of adsorption increases with increasing absolute methane adsorption amount, indicating that the adsorption heat is mainly affected by the interaction between the adsorbed methane molecules. (3) Bangham kinetic model can be used to describe the dynamic adsorption process of methane on shale. Higher temperature and pressure lead to a lower Bangham adsorption rate constant, which makes it more difficult to adsorb methane molecules for shale. This is consistent with the conclusion drawn from the thermodynamics study of absolute adsorption isotherms of methane on shale.

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语言: English

文献类型: Article

作者关键词: Shale gas; Methane adsorption; Adsorption mechanisms; Thermodynamics; Kinetics

KeyWords Plus: HIGH-PRESSURE METHANE; NORTHEASTERN BRITISH-COLUMBIA; FORT-WORTH BASIN; MISSISSIPPIAN BARNETT SHALE; UPPER YANGTZE PLATFORM; ORGANIC-RICH SHALES; NORTH-CENTRAL TEXAS; SICHUAN BASIN; GEOLOGICAL CONTROLS; LONGMAXI SHALE

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标题: Effects of surface coal mining and land reclamation on soil properties: A review

作者: Feng, Y (Feng, Yu); Wang, JM (Wang, Jinman); Bai, ZK (Bai, Zhongke); Reading, L (Reading, Lucy)

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摘要: Opencast coal mining has a series of consequences on land resources and places enormous pressure on the ecological environment. Stripping, excavation, transportation and dumping have different effects on soil physical, chemical and biological properties. Moreover, the reconstructed landscape produces increased small-scale spatial heterogeneity of mined soils. Currently, growing concerns for the negative consequences of mining have highlighted the importance of reclamation in minesoil studies. This review has examined the mechanisms of coal mining and reclamation that affect soil properties (physical, chemical, biological) and described soil development in reclamation, with an emphasis on the reclaimed minesoil (RMS) properties of reclamation sites. The major conclusions of this review were: (i) The randomness of soil dumping increased the heterogeneity of minesoil properties, which in turn increased the complexity of reclamation practice. (ii) The negative or positive consequences of mining and reclamation processes on RMS need to be recognized by scientific observations such as soil property multi-index analysis and soil chronosequences, on which the minesoil reconstruction practice are based. (iii) Five phases of reclamation (Le., geomorphic reshaping, soil reconstruction, hydrological stability, vegetation restoration, and landscape rebuilding) should be considered as a comprehensive system for the reconstruction of minesoils. (iv) The application of new technologies (e.g., micro-terrain reshaping and soil non-destructive detection) and new studies (e.g., systematic study, rebuilding animal habitat, and biodiversity research) to minesoil recovery practice would enhance the new concepts of land reclamation and ecological restoration in mining areas.

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语言: English

文献类型: Review

作者关键词: Reclaimed mine soil (RMS); Soil properties; Surface coal mining; Reclamation; Five phases of reclamation

KeyWords Plus: ACID-MINE DRAINAGE; CARBON SEQUESTRATION; PHYSICAL-PROPERTIES; RECLAIMED MINESOILS; FOREST SOIL; SPONTANEOUS SUCCESSION; ENZYME-ACTIVITIES; ORGANIC-CARBON; SPOIL HEAPS; HYDROLOGICAL CHARACTERISTICS

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输出日期: 2022-01-19

标题: Trade-offs in land-use competition and sustainable land development in the North China Plain

作者: Jin, G (Jin, Gui); Chen, K (Chen, Kun); Wang, P (Wang, Pei); Guo, BS (Guo, Baishu); Dong, Y (Dong, Yin); Yang, J (Yang, Jun)

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摘要: Using the Computable General Equilibrium of Land Use Change (CGELUC) and Dynamics of Land System (DLS) models, we simulated land-use structures and patterns in Shandong Province in 2025 under three scenarios: baseline, resource consumption, and green development. Compared with the situation in 2015, a slight decrease in grassland, cultivated, and unused land was evident under the green development scenario. Forest land cover remained basically unchanged, whereas water bodies and construction land increased slightly. Under the baseline and resource consumption scenarios, all of the above land-use types showed a decreasing trend apart from construction land, which rapidly increased. Changes in the land-use allocation pattern demonstrated overall consistency and local differences under these scenarios. Among them, most changes in construction and cultivated land occurred around cities, with changes in forests and grassland mainly distributed in the central and northeastern regions. Changes in water bodies and unused land mainly occurred in the northern Yellow River basin and in northeastern coastal areas. Local differences were evident under the green development scenario, with conversion of a small amount of cultivated land in the central region into forests and grassland, and transformation of a small area of cultivated land in the northeastern coastal area into water bodies. The study's findings provide a scientific projection of competitive land-use relations in Shandong Province over the next decade under different land expropriation price and regulation scenarios, which can guide policy formulation and the selection of pathways for achieving sustainable regional development.

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文献类型: Article

作者关键词: Land-use competition and trade-offs; Scenarios; Simulation; CGELUC model; DLS model; North China Plain

KeyWords Plus: USE/LAND-COVER CHANGE; LOGISTIC-REGRESSION; ECOSYSTEM SERVICE; CELLULAR-AUTOMATA; URBAN EXPANSION; DYNAMICS; IMPACTS; MODEL; URBANIZATION; EFFICIENCY

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标题: Synergistic integration of Bi metal and phosphate defects on hexagonal and monoclinic BiPO4: Enhanced photocatalysis and reaction mechanism

作者: Li, JR (Li, Jiarui); Zhang, WD (Zhang, Wendong); Ran, MX (Ran, Maoxi); Sun, YJ (Sun, Yanjuan); Huang, HW (Huang, Hongwei); Dong, F (Dong, Fan)

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摘要: Bi metal deposited hexagonal BiPO4 with the exposure of {102} facet (Bi-HBPO-102) and Bi metal deposited monoclinic BiPO4 with the exposure of {120} facet (Bi-MBPO-120) were prepared by chemical deposition method and solvothermal approach, respectively. The as-prepared catalysts presented more efficient photo catalytic activity of NO removal than pure BiPO4 (2.0% for BiPO4, 51.4% for Bi-HBPO-102 and 36.2% for Bi-MBPO-120) under visible light irradiation, which can be attributed to the synergistic effects endowed by the phosphate defect, the surface plasmon resonance (SPR) effect of Bi metal and the facet effect. The existence of phosphate defect was confirmed by the XPS and solid state EPR technique. The DFT calculation revealed the position of phosphate and the phosphate defect induced the formation of an intermediate level within the forbidden band to allow efficient charge transfer from valence band to conduction band. Moreover, the Bi metal would act as the electron contributor and electron conductor which facilitated the charge carriers separation. Therefore, a new charge transfer pathway can be certified on account of the fact that the covalent loop was evidently generated both at the interface and along with the path of [Bi2O2](2+) -> Bi metal -> PO43- on the Bi@BiPO4. More importantly, the Bi-HBPO-102 with exposure of {102} facet exhibited higher photocatalytic activity than the Bi-MBPO-120 with exposed {120} facet. The {102} facet with the stronger distorted PO4 tetrahedron and the lower potential energy barrier (-17.5eV) contributed to the contacted interface with the more efficient charge transfer, which promoted the generation of active radicals on {102} facet. Additionally, for Bi-HBPO-102, the reaction intermediate NO+ can be observed with in situ DRIFTS, which facilitated the activation of NO via the formation of NO+ to promote the oxidation of NOx into final products. Herein, a new strategy for tailoring the charge transfer pathway was developed to enhance the photocatalytic performance and a new photocatalytic reaction mechanism for photocatalytic NOx removal was proposed. This work could provide new insights into the modification of photocatalysts and mechanistic understanding of the gas-phase photocatalytic reaction mechanism.

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语言: English

文献类型: Article

作者关键词: BiPO4; Photocatalysis mechanism; SPR effect; Bi metal; pHosphate defect

KeyWords Plus: TOTAL-ENERGY CALCULATIONS; GRAPHITIC CARBON NITRIDE; NO ADSORPTION; NO+O-2 COADSORPTION; TIO2 PHOTOCATALYST; CHARGE SEPARATION; OXYGEN VACANCY; FT-IR; EFFICIENT; REMOVAL

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标题: Human health risks of heavy metals in paddy rice based on transfer characteristics of heavy metals from soil to rice

作者: Mao, CP (Mao, Changping); Song, YX (Song, Yinxian); Chen, LX (Chen, Lingxiao); Ji, JF (Ji, Junfeng); Li, JZ (Li, Jizhou); Yuan, XY (Yuan, Xuyin); Yang, ZF (Yang, Zhongfang); Ayoko, GA (Ayoko, Godwin A.); Frost, RL (Frost, Ray L.); Theiss, F (Theiss, Frederick)

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摘要: In order to investigate the transfer and accumulation pathways of heavy metals in cropland ecosystems, an investigation of the geochemical behaviors of heavy metals in soil and rice plants was carried out in the Yangtze River Delta. Soil is one of the biggest reservoirs of heavy metals and affects food safety at the beginning of the food chain. The results of this study demonstrate that heavy metal levels in soil decreased with increasing soil pH, while rice shoots accumulated heavy metals more readily under low soil pH conditions. The non-carcinogenic hazard quotients (HQ) of heavy metals show that health risks for humans were primarily due to Pb and As. Furthermore, cancer risk (Risk) results suggested that similar to 76% and similar to 15.7% of cancer risk was caused by Cd and As levels, respectively. Decreasing soil pH enhanced the non-carcinogenic and carcinogenic health risks for the human body. Through exponential change between transfer factor (TFgrain/soll) and soil metals, HQ, a direct monitoring method for rice plants, was built using regression curves. It is proposed that besides condition of soil with high heavy metal concentration, for rice grown with surface soil metals, the safety of the rice product should be monitored when soil metals are under the following levels after harvest: non-carcinogenic risk, As < 20 mg/kg, Pb < 100 mg/kg, Cd < 0.07-0.68 mg/kg and Cu 7.56-30.87 mg/kg; and cancer risk, As < 20 mg/kg, Cd < 4 mg/kg and Cr < 200 mg/kg.

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作者关键词: Heavy metals; Paddy rice; Transfer factor; Health risk assessment; Yangtze River Delta

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标题: Mercury in marine Ordovician/Silurian boundary sections of South China is sulfide-hosted and non-volcanic in origin

作者: Shen, J (Shen, Jun); Algeo, TJ (Algeo, Thomas J.); Chen, JB (Chen, Jiubin); Planavsky, NJ (Planavsky, Noah J.); Feng, QL (Feng, Qinglai); Yu, JX (Yu, Jianxin); Liu, JL (Liu, Jinling)

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摘要: Mercury (Hg) enrichment in stratigraphic successions is now widely used as a proxy for volcanic inputs, often for the purpose of documenting a relationship between large igneous province (LIP) magmatism and ecosystem perturbations. Earlier studies of Hg in Ordovician/Silurian boundary (OSB) sections in South China and Laurentia identified transient spikes in Hg/TOC ratios, on the basis of which a link between volcanism and the Late Ordovician mass extinction (LOME) was claimed. However, Hg enrichments must be tested based on normalization to their main host phase, and Hg/TOC is a suitable proxy only if Hg is mainly complexed by organic matter in the sediment. Here, we demonstrate that Hg in three OSB sections in South China (Qjliao, Yanzhi, and Jiaoye) is overwhelmingly associated with pyrite, as shown by r((Hg-TS)) > 0.9 (versus r((Hg-TOC)) < 0.1) and by EDS elemental mapping. This association requires that Hg concentrations be normalized to pyrite content as proxied by total sulfur [TS], rather than to total organic carbon [TOC]. The resulting Hg/TS profiles show no significant enrichments at any level within the Upper Ordovician-lower Silurian of the study sections. Also, mercury isotope data show constant mass-independent fractionation (Delta Hg-199) values (+0.11 +/- 0.03 parts per thousand) that are inconsistent with volcanic inputs. We therefore infer that previous reports of Hg enrichments in OSB sections were due to the presence of Hg-rich sulfides, and that Hg data from both the present and earlier studies provide no evidence of any volcanic influences on the LOME. The results of the present study highlight the need for caution in applying the Hg proxy for volcanic inputs and the importance of evaluating the main host phase of Hg in paleo-marine sediments. (C) 2019 Elsevier B.V. All rights reserved.

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作者关键词: volcanism; mass extinction; black shale; pyrite; anoxia; mercury isotopes

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标题: Time series analysis and long short-term memory neural network to predict landslide displacement

作者: Yang, BB (Yang, Beibei); Yin, KL (Yin, Kunlong); Lacasse, S (Lacasse, Suzanne); Liu, ZQ (Liu, Zhongqiang)

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摘要: A good prediction of landslide displacement is an essential component for implementing an early warning system. In the Three Gorges Reservoir Area (TGRA), many landslides deform distinctly and in steps from April to September each year under the influence of seasonal rainfall and periodic fluctuation in reservoir water level. The sliding becomes more uniform again from October to April. This landslide deformation pattern leads to accumulated displacement versus time showing a step-wise curve. Most of the existing predictive models express static relationships only. However, the evolution of a landslide is a complex nonlinear dynamic process. This paper proposes a dynamic model to predict landslide displacement, based on time series analysis and long short-term memory (LSTM) neural network. The accumulated displacement was decomposed into a trend term and a periodic term in the time series analysis. A cubic polynomial function was selected to predict the trend displacement. By analyzing the relationships between landslide deformation, rainfall, and reservoir water level, a LSTM model was used to predict the periodic displacement. The LSTM approach was found to properly model the dynamic characteristics of landslides than static models, and make full use of the historical information. The performance of the model was validated with the observations of two step-wise landslides in the TGRA, the Baishuihe landslide and Bazimen landslide. The application of the model to those two landslides demonstrates that the LSTM model provides a good representation of the measured displacements and gives a more reliable prediction of landslide displacement than the static support vector machine (SVM) model. It is concluded that the proposed model can be used to effectively predict the displacement of step-wise landslides in the TGRA.

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作者关键词: Displacement prediction; Step-wise landslide; Time series; Long short-term memory neural network; Three Gorges Reservoir

KeyWords Plus: 3 GORGES RESERVOIR; EXTREME LEARNING-MACHINE; STEP-LIKE LANDSLIDE; XINMO LANDSLIDE; MODEL; AREA; MECHANISM; SICHUAN; CHINA

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标题: Earth abundant materials beyond transition metal dichalcogenides: A focus on electrocatalyzing hydrogen evolution reaction

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摘要: The depletion of the unsustainable fossil fuels drives the exploration of renewable and clean energy. Hydrogen gas, as the potential alternative for the future energy supply, is now considered as the primary choice. Recently, with the assistance of the non-noble metal based compounds, electrocatalytic hydrogen evolution has aroused tremendous attention. In particular, earth abundant materials beyond transition metal dichalcogenides, such as transition metal phosphides, carbides, nitrides, demonstrate highly active and efficient activity toward hydrogen evolution reaction (HER) under different conditions. In this review, focused on these materials, we systemically discuss their recent development in electrocatalytic hydrogen generation. The synthesis routes utilized to prepare superior and specific catalyst are highlighted. Then, we provide insight into the characterization and electrochemical performance of these materials as HER electrocatalysts. In the end, the challenges of these materials, important issues about studying eletablctrocatalysts and future perspectives are stressed.

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标题: Improved population mapping for China using remotely sensed and points-of-interest data within a random forests model

作者: Ye, TT (Ye, Tingting); Zhao, NZ (Zhao, Naizhuo); Yang, XC (Yang, Xuchao); Ouyang, ZT (Ouyang, Zutao); Liu, XP (Liu, Xiaoping); Chen, Q (Chen, Qian); Hu, KJ (Hu, Kejia); Yue, WZ (Yue, Wenze); Qi, JG (Qi, Jiaguo); Li, ZS (Li, Zhansheng); Jia, P (Jia, Peng)

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摘要: Remote sensing image products (e.g. brightness of nighttime lights and land cover/land use types) have been widely used to disaggregate census data to produce griciclecl population maps for large geographic areas. The advent of the geospatial big data revolution has created additional opportunities to map population distributions at fine resolutions with high accuracy. A considerable proportion of the geospatial data contains semantic information that indicates different categories of human activities occurring at exact geographic locations. Such information is often lacking in remote sensing data. In addition, the remarkable progress in machine learning provides toolkits for demographers to model complex nonlinear correlations between population and heterogeneous geographic covariates. In this study, a typical type of geospatial big data, points-of-interest (POls), was combined with multi source remote sensing data in a random forests model to disaggregate the 2010 county-level census population data to 100 x 100 m grids. Compared with the WorldPop population dataset, our population map showed higher accuracy. The root mean square error for population estimates in Beijing, Shanghai, Guangzhou, and Chongqing for this method and WorldPop were 27,829 and 34,193, respectively. The large under-allocation of the population in urban areas and over-allocation in rural areas in the WorldPop dataset was greatly reduced in this new population map. Apart from revealing the effectiveness of POls in improving population mapping, this study promises the potential of geospatial big data for mapping other socioeconomic parameters in the future. (C) 2018 Elsevier B.V. All rights reserved.

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作者: Yu, HJ (Yu, Hongjian); Li, JY (Li, Jieyuan); Zhang, YH (Zhang, Yihe); Yang, SQ (Yang, Songqiu); Han, KL (Han, Keli); Dong, F (Dong, Fan); Ma, TY (Ma, Tianyi); Huang, HW (Huang, Hongwei)

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摘要: A facile and controllable in situ reduction strategy is used to create surface oxygen vacancies (OVs) on Aurivillius-phase Sr2Bi2Nb2TiO12 nanosheets, which were prepared by a mineralizer-assisted soft-chemical method. Introduction of OVs on the surface of Sr2Bi2Nb2TiO12 extends photoresponse to cover the whole visible region and also tremendously promotes separation of photoinduced charge carriers. Adsorption and activation of CO2 molecules on the surface of the catalyst are greatly enhanced. In the gas-solid reaction system without co-catalysts or sacrificial agents, OVs-abundant Sr2Bi2Nb2TiO12 nanosheets show outstanding CO2 photoreduction activity, producing CO with a rate of 17.11 mu mol g(-1) h(-1), about 58 Limes higher than that of the bulk counterpart, surpassing most previously reported state-of-the-art photocatalysts. Our study provides a three-in-one integrated solution to advance the performance of photocatalysts for solar-energy conversion and generation of renewable energy.

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输出日期: 2022-01-19

标题: Promoted peroxymonosulfate activation into singlet oxygen over perovskite for ofloxacin degradation by controlling the oxygen defect concentration

作者: Gao, PP (Gao, Panpan); Tian, XK (Tian, Xike); Nie, YL (Nie, Yulun); Yang, C (Yang, Chao); Zhou, ZX (Zhou, Zhaoxin); Wang, YX (Wang, Yanxin)

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摘要: Recently, perovskite is becoming a promising alternative as peroxymonosulfate (PMS) activator for the remediation of organic pollutants in water. But the factor determining PMS activation efficiency of perovskite and the evolution of reactive oxygen species (ROS) remain equivocal and elusive. In this study, we proposed an oxygen defect dependent PMS activation mechanism over perovskite with the singlet oxygen (O-1(2)) as the dominant ROS. Among the tested four perovskites, ofloxacin (OFX) degradation efficiency increased with the following order: LaFeO3 < LaZnO3 < LaMnO3 < LaNiO3, which agreed well with their oxygen defect amounts based on X-ray photoelectron spectroscopy (XPS) and electron paramagnetic resonance (EPR) analysis. The results clearly demonstrated a good relationship among oxygen defects in LaBO3, OFX degradation efficiency and O-1(2) concentration. Moreover, O-1(2) evolution mechanism over perovskite by decreasing the activation energy of PMS self-decomposition was proposed. The O-1(2) mediated OFX degradation pathway was further studied by HPLC-MS technique and three-dimensional excitation-emission matrix fluorescence spectroscopy (3D EEMs). This work provides a new insight into PMS activation by perovskites and favors its application in actual water treatment.

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作者关键词: Peroxymonosulfate; Activation; Perovskite; Key factor; Reaction mechanism

KeyWords Plus: OXIDATION; MECHANISM; PRODUCTS; PERSULFATE; DECOMPOSITION; INSIGHTS; CU; ANTIBIOTICS; VACANCIES; EVOLUTION

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标题: Mesopore-Induced Ultrafast Na+-Storage in T-Nb2O5/Carbon Nanofiber Films toward Flexible High-Power Na-Ion Capacitors

作者: Li, YZ (Li, Yuzhu); Wang, HW (Wang, Huanwen); Wang, LB (Wang, Libin); Mao, ZF (Mao, Zhifei); Wang, R (Wang, Rui); He, BB (He, Beibei); Gong, YS (Gong, Yansheng); Hu, XL (Hu, Xianluo)

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摘要: Hybrid Na-ion capacitors (NICs) are receiving considerable interest because they combine the merits of both batteries and supercapacitors and because of the low-cost of sodium resources. However, further large-scale deployment of NICs is impeded by the sluggish diffusion of Na+ in the anode. To achieve rapid redox kinetics, herein the controlled fabrication of mesoporous orthorhombic-Nb2O5 (T-Nb2O5)/carbon nanofiber (CNF) networks is demonstrated via in situ SiO2-etching. The as-obtained mesoporous T-Nb2O5 (m-Nb2O5)/CNF membranes are mechanically flexible without using any additives, binders, or current collectors. The in situ formed mesopores can efficiently increase Na+-storage performances of the m-Nb2O5/CNF electrode, such as excellent rate capability (up to 150 C) and outstanding cyclability (94% retention after 10 000 cycles at 100 C). A flexible NIC device based on the m-Nb2O5/CNF anode and the graphene framework (GF)/mesoporous carbon nanofiber (mCNF) cathode, is further constructed, and delivers an ultrahigh power density of 60 kW kg(-1) at 55 Wh kg(-1) (based on the total weight of m-Nb2O5/CNF and GF/mCNF). More importantly, owing to the free-standing flexible electrode configuration, the m-Nb2O5/CNF//GF/mCNF NIC exhibits high volumetric energy and power densities (11.2 mWh cm(-3), 5.4 W cm(-3)) based on the full device, which holds great promise in a wide variety of flexible electronics.

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作者关键词: carbon nanofibers; flexible; mesoporous; Nb2O5; sodium-ion capacitors

KeyWords Plus: HIGH-ENERGY; ANODE MATERIAL; NB2O5 NANOSHEETS; HYBRID SUPERCAPACITOR; GRAPHENE OXIDE; PERFORMANCE; NANOWIRE; ELECTRODE; SINGLE; NANOCRYSTALS

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作者: Liu, YN (Liu, Yining); Guo, W (Guo, Wei); Fan, CI (Fan, Chun-I); Chang, L (Chang, Liang); Cheng, C (Cheng, Chi)

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摘要: The real-time electricity consumption data can be used in value-added service such as big data analysis, meanwhile the single user's privacy needs to be protected. How to balance the data utility and the privacy preservation is a vital issue, where the privacy-preserving data aggregation could be a feasible solution. Most of the existing data aggregation schemes rely on a trusted third party (TTP). However, this assumption will have negative impact on reliability, because the system can be easily knocked down by the denial of service attack. In this paper, a practical privacy-preserving data aggregation scheme is proposed without TTP, in which the users with some extent trust construct a virtual aggregation area to mask the single user's data, and meanwhile, the aggregation result almost has no effect for the data utility in large scale applications. The computation cost and communication overhead are reduced in order to promote the practicability. Moreover, the security analysis and the performance evaluation show that the proposed scheme is robust and efficient.

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作者关键词: Data aggregation; data utility; distributed decryption algorithm; privacy preservation; smart grid

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标题: Effect of Chinese policies on rare earth supply chain resilience

作者: Mancheri, NA (Mancheri, Nabeel A.); Sprecher, B (Sprecher, Benjamin); Bailey, G (Bailey, Gwendolyn); Ge, JP (Ge, Jianping); Tukker, A (Tukker, Arnold)

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摘要: Rare earths elements (REE) are considered as strategic resources because they interact with business and governments' direct policy interventions. Policy interventions can have a major effect on security of rare earth supply (Kooroshy et al., 2015). The purpose of this study is to scrutinize China's REE policies and its impacts on the supply chain resilience. We analyze the supply chain dynamics by specifically targeting a number of Chinese REE policies that have disruptive tendencies. We analyze various policies placing the price at the center as an overarching feedback loop. In other words, we focus on how price responds to various resilience influencing mechanisms such as diversity of supply, regulatory frameworks, and stockpiling. In the process, we investigate Chinese influence on rest of the world (RoW) supply chain and dynamics inside the Chinese supply chain as there are two different layers of supply chain one for China and another one for rest of the world. We show that the supply chain is a complex phenomenon and resilience of a system is not solely dependent on physical disruptions but also on dynamic factors such as societal and geo-political (eg. environmental regulation, speculative market and export ban). We identify links and interdependencies even where data is not readily available and examine how the overall system reacts to various constraints and disruptions.

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作者关键词: Rare earth elements; Resilience; REE policy; Supply chain

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标题: Experimental study on lateral flooding for enhanced oil recovery in bottom-water reservoir with high water cut

作者: You, Q (You, Qing); Wen, QY (Wen, Quanyi); Fang, JC (Fang, Jichao); Guo, M (Guo, Min); Zhang, QS (Zhang, Qingsheng); Dai, CL (Dai, Caili)

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摘要: The regular enhanced oil recovery (EOR) methods in bottom-water reservoir aim to increase the vertical sweep efficiency. After multicycle chemical injection, the injected slug cannot effectively control the bottom water coning in the presence of fully developed water channel, decreasing the sweep efficiency and lowering economic efficiency. To improve the development effect of bottom-water reservoir, lateral flooding is proposed as a more cost-effective EOR technique by displacing the oil formation horizontally. In this study, three lateral flooding tests were performed in a three-dimensional physical model based on the geometric similarity criterion. Bottom-water reservoirs were simulated by sandpacking oil and water formations according to the parameters of the target oil reservoir. The bottom-water energy was supplied by an ISCO constant pressure, and the lateral flooding was conducted by an ISCO constant rate pumps. The oil recovery, water cut, pressure drop, and saturation variation maps obtained from these tests were recorded and analyzed. A comparison of these results between different crosslinked polymer slug tests shows that the improved oil recovery by lateral waterflooding can be mainly attributed to a significant increase in horizontal sweep efficiency. After 0.3 PV crosslinked polymer injection, about two-thirds of that was used to shut off the main water channels; the chemical packer, formed by the surplus polymer spreading along the oil/water interface under the drive of lateral injection, can inhibit bottom water from coning into the oil formation and prevent the crossflow. The 0.2, 0.3, and 0.4 PV crosslinked polymer injection can increase oil recovery by as much as 11.35, 36.23, and 39.74% of the original oil-in-place (OOIP), respectively. This confirms that lateral flooding is an efficient EOR method in bottom-water reservoir.

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作者关键词: Bottom-water reservoir; Lateral flooding; Crosslinked polymer; Enhanced oil recovery; Packer

KeyWords Plus: FOAM; PERFORMANCE; WELLS

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作者: Zhang, BG (Zhang, Baogang); Wang, S (Wang, Song); Diao, MH (Diao, Muhe); Fu, J (Fu, Jie); Xie, MM (Xie, Miaomiao); Shi, JX (Shi, Jiaxin); Liu, ZQ (Liu, Ziqi); Jiang, YF (Jiang, Yufeng); Cao, XL (Cao, Xuelong); Borthwick, AGL (Borthwick, Alistair G. L.)

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摘要: Vanadium mining activities can cause contamination of the surrounding geological environment. Vanadium may exist in multiple matrices due to its migration and transformation, forming interactive relationships; however, the connection between vanadium distributions in multiple matrices and microbial community responses remains largely unknown. Vanadium is a redox-sensitive metal that can be microbiologically reduced and immobilized. To date, bioremediation of vanadium-contaminated environments by indigenous microorganisms has rarely been evaluated. This paper reports a systematic investigation into vanadium distributions and microbial communities in soils, water, and sediment from Panzhihua, China. Large vanadium contents of 1130.19.8mg/kg and 0.130.02mg/L were found in surface soil and groundwater. Vanadium in surface water tended to precipitate. Microbial communities isolated from similar environments were alike due to similarity in matrix chemistry whereas communities were distinct when compared to different matrices, with lower richness and diversity in groundwater. Proteobacteria was distributed widely and dominated microbial communities within groundwater. Redundancy analysis shows that vanadium and nutrients significantly affected metal-tolerant bacteria. Long-term cultivation (240days) suggests the possibility of vanadium bioremediation by indigenous microorganisms, within acid-soluble fraction. This active fraction can potentially release mobile vanadium with shifted redox conditions. Vanadium (V) was bio-reduced to less toxic, mobile vanadium (IV) primarily by enriched Bacillus and Thauera. This study reveals the biogeochemical fate of vanadium in regional geological environments and suggests a bioremediation pathway via native vanadium-reducing microbes.

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文献类型: Article

作者关键词: vanadium; biogeochemical process; bioremediation; microbial community; geological environment

KeyWords Plus: ORGANIC-CARBON SOURCES; BIOELECTRICITY GENERATION; METAL CONCENTRATIONS; V REDUCTION; SOIL; GROUNDWATER; PRECIPITATION; REMOVAL; FRACTIONATION; DIVERSITY

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Greening in Rural Areas Increases the Surface Urban Heat Island Intensity

作者: Yao, R (Yao, Rui); Wang, LC (Wang, Lunche); Huang, X (Huang, Xin); Gong, W (Gong, Wei); Xia, XG (Xia, Xiangao)

来源出版物: GEOPHYSICAL RESEARCH LETTERS 卷: 46 期: 4 页: 2204-2212 DOI: 10.1029/2018GL081816 出版年: FEB 28 2019

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摘要: In this study, Moderate Resolution Imaging Spectroradiometer land cover, land surface temperature (LST), and enhanced vegetation index (EVI) data were used to investigate the trends of surface urban heat island intensity (SUHII, urban LST minus rural LST) and their relations with vegetation in 397 global big cities during 2001-2017. Major findings include the following: (1) Annual daytime and nighttime SUHII increased significantly (p < 0.05, Mann-Kendall trend test) in 42.1% and 30.5% cities, respectively. (2) The daytime SUHII in the growing season was significantly and positively correlated with rural EVI in 58.9% cities. This is because high rural EVI can increase the EVI difference between urban and rural areas. (3) Rural greening contributed 22.5% of the increased daytime SUHII in the growing season at the global scale. This study highlights that the effect of greening in rural areas was a significant and widespread driver for the increased daytime SUHII.

Plain Language Summary Surface urban heat island (SUHI) refers to higher land surface temperature (LST) in urban than in rural areas. The increased SUHI intensity (urban LST minus rural) was mainly attributed to increased anthropogenic heat emission and built-up areas and reductions in vegetation in urban areas in the literature. However, this study showed that the increased vegetation (i.e., greening) in rural areas was a significant and widespread driver for the increased daytime SUHI intensity around the world during 2001-2017. The implication of this study is that urban LST may increase much faster than rural LST in future global warming.

入藏号: WOS:000461855600034

语言: English

文献类型: Article

KeyWords Plus: TEMPORAL TRENDS; CLIMATE; FOOTPRINT; CITIES; DETERMINANTS; TEMPERATURE; CHINA

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Achieving Efficient Incorporation of pi-Electrons into Graphitic Carbon Nitride for Markedly Improved Hydrogen Generation

作者: Li, J (Li, Jing); Wu, DD (Wu, Dandan); Iocozzia, J (Iocozzia, James); Du, HW (Du, Haiwei); Liu, XQ (Liu, Xueqin); Yuan, YP (Yuan, Yupeng); Zhou, W (Zhou, Wei); Li, Z (Li, Zhen); Xue, ZM (Xue, Zhaoming); Lin, ZQ (Lin, Zhiqun)

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摘要: A rapid and highly efficient strategy for introducing C into g-C3N4 involves copolymerizing pi-electron-rich barbituric acid with melamine via a facile microwave-assisted heating, thereby eliminating the issues in conventional electric furnace heating, such as the severe volatilization, owing to the mismatch of the sublimation temperatures of barbituric acid and melamine. The g-C3N4 catalyst after optimizing the C-doping content actively generates increased amounts of H-2 under visible light exposure with the highest H-2 generation rate of 25.0 mu molh(-1), which is nearly 20 times above that using g-C3N4 produced by conventional electric furnace heating of two identical monomers (1.3 mu molh(-1)). As such, the microwave-assisted heating strategy may stand out as an extremely simple route to incorporating pi-electrons into g-C3N4 with markedly improved photocatalytic performance.

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文献类型: Article

作者关键词: carbon nitride; microwaves; photocatalysis; pi-electrons

KeyWords Plus: STEP CLOSER; PHOTOREACTIVITY; PHOTOCATALYSTS; SEMICONDUCTORS; EVOLUTION; WATER

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Designing surface-enhanced Raman scattering (SERS) platforms beyond hotspot engineering: emerging opportunities in analyte manipulations and hybrid materials

作者: Lee, HK (Lee, Hiang Kwee); Lee, YH (Lee, Yih Hong); Koh, CSL (Koh, Charlynn Sher Lin); Gia, CPQ (Gia Chuong Phan-Quang); Han, XM (Han, Xuemei); Lay, CL (Lay, Chee Leng); Sim, HYF (Sim, Howard Yi Fan); Kao, YC (Kao, Ya-Chuan); An, Q (An, Qi); Ling, XY (Ling, Xing Yi)

来源出版物: CHEMICAL SOCIETY REVIEWS 卷: 48 期: 3 页: 731-756 DOI: 10.1039/c7cs00786h 出版年: FEB 4 2019

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引用的参考文献数: 50

摘要: Surface-enhanced Raman scattering (SERS) is a molecule-specific spectroscopic technique with diverse applications in (bio) chemistry, clinical diagnosis and toxin sensing. While hotspot engineering has expedited SERS development, it is still challenging to detect molecules with no specific affinity to plasmonic surfaces. With the aim of improving detection performances, we venture beyond hotspot engineering in this tutorial review and focus on emerging material design strategies to capture and confine analytes near SERS-active surfaces as well as various promising hybrid SERS platforms. We outline five major approaches to enhance SERS performance: (1) enlarging Raman scattering cross-sections of non-resonant molecules via chemical coupling reactions; (2) targeted chemical capturing of analytes through surface-grafted agents to localize them on plasmonic surfaces; (3) physically confining liquid analytes on non-wetting SERS-active surfaces and (4) confining gaseous analytes using porous materials over SERS hotspots; (5) synergizing conventional metal-based SERS platforms with functional materials such as graphene, semiconducting materials, and piezoelectric polymers. These approaches can be integrated with engineered hotspots as a multifaceted strategy to further boost SERS sensitivities that are unachievable using hotspot engineering alone. Finally, we highlight current challenges in this research area and suggest new research directions towards efficient SERS designs critical for real-world applications.

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PubMed ID: 30475351

语言: English

文献类型: Review

KeyWords Plus: METAL-ORGANIC FRAMEWORK; HOT-SPOTS; ULTRASENSITIVE DETECTION; SILVER OCTAHEDRA; GRAPHENE OXIDE; AG NANOCUBES; SPECTROSCOPY; SUBSTRATE; TOXIN; SEMICONDUCTOR

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ESI 热点论文: N

输出日期: 2022-01-19

标题: A Correlation-Based Feature Weighting Filter for Naive Bayes

作者: Jiang, LX (Jiang, Liangxiao); Zhang, LG (Zhang, Lungan); Li, CQ (Li, Chaoqun); Wu, J (Wu, Jia)

来源出版物: IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING 卷: 31 期: 2 页: 201-213 DOI: 10.1109/TKDE.2018.2836440 出版年: FEB 1 2019

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摘要: Due to its simplicity, efficiency, and efficacy, naive Bayes (NB) has continued to be one of the top 10 algorithms in the data mining and machine learning community. Of numerous approaches to alleviating its conditional independence assumption, feature weighting has placed more emphasis on highly predictive features than those that are less predictive. In this paper, we argue that for NB highly predictive features should be highly correlated with the class (maximum mutual relevance), yet uncorrelated with other features (minimum mutual redundancy). Based on this premise, we propose a correlation-based feature weighting (CFW) filter for NB. In CFW, the weight for a feature is a sigmoid transformation of the difference between the feature-class correlation (mutual relevance) and the average feature-feature intercorrelation (average mutual redundancy). Experimental results show that NB with CFW significantly outperforms NB and all the other existing state-of-the-art feature weighting filters used to compare. Compared to feature weighting wrappers for improving NB, the main advantages of CFW are its low computational complexity (no search involved) and the fact that it maintains the simplicity of the final model. Besides, we apply CFW to text classification and have achieved remarkable improvements.

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语言: English

文献类型: Article

作者关键词: Feature weighting; naive Bayes; correlation; mutual information; mutual relevance; mutual redundancy

KeyWords Plus: FEATURE-SELECTION; STATISTICAL COMPARISONS; ROC CURVE; CLASSIFIERS; ALGORITHMS; AREA

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Utilization of red mud in road base and subgrade materials: A review

作者: Mukiza, E (Mukiza, Emile); Zhang, LL (Zhang, LingLing); Liu, XM (Liu, Xiaoming); Zhang, N (Zhang, Na)

来源出版物: RESOURCES CONSERVATION AND RECYCLING 卷: 141 页: 187-199 DOI: 10.1016/j.resconrec.2018.10.031 出版年: FEB 2019

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摘要: Red mud is highly alkaline slurry produced during alumina extraction from bauxite. Its disposal generates serious environmental pollution. The best way to solve red mud disposal issues is to develop economic utilization technologies that consume significant amounts of red mud. This paper reviews the possibility of utilizing red mud as a road base material, weak subgrade soil stabilizer as well as a subgrade material. Results showed that red mud can be used for those purposes. It was also found that the stabilizing content needed to meet a certain standard differs due to differences in requirements from one country to another. Therefore, there is a need to design proportions with UCS, CBR, leaching characteristics required by the country in which red mud is intended for use. The effect of various stabilizers on performance of red mud is discussed and it transpired that lime showed the best performance followed by dolime fine, ground granulated blast furnace slag, cement kiln dust and fly ash. Findings indicated that red mud shows better performance as a subgrade material than natural soil. Also the synergistic use of red mud and other wastes also improves the mechanical and durability properties of the material compared with using red mud alone. Based on mechanical, economic and environmental benefits, it is recommended to use red mud in road base structure rather than in subgrade despite higher red mud consumption in subgrade than in road base. The scope for future research in this area is also suggested.

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语言: English

文献类型: Review

作者关键词: Red mud; Alkaline; Pollution; Utilization; Subgrade; Road base

KeyWords Plus: LIFE-CYCLE ASSESSMENT; RECYCLED BASSANITE; BAUXITE WASTE; FLY-ASH; CEMENT; CLAY; GEOPOLYMER; STRENGTH; INDUSTRY; WATER

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标题: Current status and geological conditions for the applicability of CBM drilling technologies in China: A review

作者: Tao, S (Tao, Shu); Pan, ZJ (Pan, Zhejun); Tang, SL (Tang, Shuling); Chen, SD (Chen, Shida)

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摘要: Coalbed methane (CBM) drilling technology is critical in achieving efficient CBM development. The geological conditions for CBM development in China are complex, including special terrain, high-rank coal areas, deep coal seams, multiple superposed coal seams and coal measure gas symbiosis areas, steeply inclined coal seam areas, and tectonic coal seam areas. Therefore, it is critical to apply the optimum drilling technology in each different area. This paper first reviews the current CBM drilling technologies and gas production behaviors in China. It is found that although vertical wells and cluster well groups are common well types for CBM development in China, U-, V- and L- shaped horizontal wells and multilateral horizontal wells have been favored for CBM development in recent years. The paper then discusses the applicability of different well types to geological conditions and proposes a modification method for well design in various geologic conditions. This method uses the coal structure, R-o, in situ stress, and ratio of critical desorption pressure to the reservoir pressure as the main inputs.

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语言: English

文献类型: Review

作者关键词: Drilling technology; Geological conditions; Deep coal seam; High-rank coal; Multiple coal seams; Well type optimization

KeyWords Plus: COALBED METHANE PRODUCTION; SOUTHERN QINSHUI BASIN; EASTERN ORDOS BASIN; STRESS-DISTRIBUTION CHARACTERISTICS; LATE PERMIAN COAL; HYDROLOGICAL CONTROLS; FANZHUANG BLOCK; LIULIN AREA; WELL; RESERVOIR

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标题: H-infinity State Estimation for Discrete-Time Nonlinear Singularly Perturbed Complex Networks Under the Round-Robin Protocol

作者: Wan, XB (Wan, Xiongbo); Wang, ZD (Wang, Zidong); Wu, M (Wu, Min); Liu, XH (Liu, Xiaohui)

来源出版物: IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS 卷: 30 期: 2 页: 415-426 DOI: 10.1109/TNNLS.2018.2839020 出版年: FEB 2019

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摘要: This paper investigates the H-infinity state estimation problem for a class of discrete-time nonlinear singularly perturbed complex networks (SPCNs) under the Round-Robin (RR) protocol. A discrete-time nonlinear SPCN model is first devised on two time scales with their discrepancies reflected by a singular perturbation parameter (SPP). The network measurement outputs are transmitted via a communication network where the data transmissions are scheduled by the RR protocol with hope to avoid the undesired data collision. The error dynamics of the state estimation is governed by a switched system with a periodic switching parameter. A novel Lyapunov function is constructed that is dependent on both the transmission order and the SPP. By establishing a key lemma specifically tackling the SPP, sufficient conditions are obtained such that, for any SPP less than or equal to a predefined upper bound, the error dynamics of the state estimation is asymptotically stable and satisfies a prescribed H-infinity performance requirement. Furthermore, the explicit parameterization of the desired state estimator is given by means of the solution to a set of matrix inequalities, and the upper bound of the SPP is then evaluated in the feasibility of these matrix inequalities. Moreover, the corresponding results for linear discrete-time SPCNs are derived as corollaries. A numerical example is given to illustrate the effectiveness of the proposed state estimator design scheme.

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语言: English

文献类型: Article

作者关键词: Complex networks; discrete-time systems; H-infinity state estimation; Round-Robin (RR) protocol; singularly perturbed system

KeyWords Plus: SYNCHRONIZATION; SYSTEMS; FEEDBACK; STABILIZATION

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输出日期: 2022-01-19

标题: In-situ construction of coral-like porous P-doped g-C3N4 tubes with hybrid 1D/2D architecture and high efficient photocatalytic hydrogen evolution

作者: Wu, M (Wu, Mao); Zhang, J (Zhang, Jin); He, BB (He, Bei-bei); Wang, HW (Wang, Huan-wen); Wang, R (Wang, Rui); Gong, YS (Gong, Yan-sheng)

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摘要: Developing novel methods to prepare hollow one-dimensional (1D) carbon nitride (g-C3N4) nanostructure is highly attractive in photocatalytic water splitting for hydrogen production. Herein, a simple, self-assembly synthesis of coral-like 3D porous P-doped g-C3N4 tubes (PCNT) by the combination of pyrolysis and freeze-drying method was reported. Attributed to the integrated merits of 1D tubular structure, 2D nanosheets and phosphorus doping, the as-prepared hollow PCNT exhibits superior photocatalytic activity under visible light irradiation. Owing to their higher specific surface area, enhanced light absorption, and better charge carrier separation and transfer, the maximum apparent photocatalytic hydrogen evolution rate of PCNT is 2020 mu mol g(-1) h(-1), which is about 4.7 folds and 22.4 folds than that of g-C3N4 tubes and pristine bulk g-C3N4, respectively. Moreover, a possible photocatalytic mechanism and nanostructure formation process based on the experimental results are proposed. The novel growth strategy developed here may offer a new avenue for the rational design and synthesis of potentially efficient photocatalyst with 1D/2D integrated nanoarchitecture.

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语言: English

文献类型: Article

作者关键词: Tubular g-C3H4; 1D/2D heterojunction; Photocatalytic hydrogen evolution; Phosphorus doping

KeyWords Plus: GRAPHITIC CARBON NITRIDE; VISIBLE-LIGHT IRRADIATION; H-2 PRODUCTION; NANOSHEETS; NANOTUBES; WATER; SURFACE; PHOTOSYNTHESIS; NANOSTRUCTURE; DEGRADATION

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标题: Self-template synthesis of double-shell TiO2@ZIF-8 hollow nanospheres via sonocrystallization with enhanced photocatalytic activities in hydrogen generation

作者: Zhang, M (Zhang, Ming); Shang, QG (Shang, Qigao); Wan, YQ (Wan, Yuqi); Cheng, QR (Cheng, Qingrong); Liao, GY (Liao, Guiying); Pan, ZQ (Pan, Zhiquan)

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摘要: The photocatalytic hydrogen evolution on inorganic semiconductors has been studied for several decades. However, the conversion efficiency of solar energy is still poor caused by the recombination of photo-generated electron-hole pairs. Semiconductors - metal organic frameworks (MOFs) hybrid photocatalysts are being regarded as promising candidates due to large surface area and porosity. Here we reported the coordinative integration of a composite material with efficient capacity of Hy evolution driven by solar light, namely TiO2@ZIF8, made up of titanium dioxide hollow nanospheres (TiO(2)HNPs) externally decorated with zeolitic imidazolate framework-8 (ZIF-8) via a facile sonochemical route. The resulting composite demonstrates the high dispersion of ZIF-8 on the surface of TiO2 HNPs and this kind of close connection makes for an efficient photocatalyst through the synergistic effect. Up to 50.89% of apparent quantum efficiency (AQE), the hybrid double-shell HNPs exhibits 3.5 times higher H-2 evolution rate (HER) than the bare TiO2 HNPs under solar light and shows good stability and recyclability. It is further proposed by photoluminescence spectra and optoelectronic measurement that the remarkably enhanced photocatalytic activity of TiO2@ZIF-8 is not only attributed to the efficient charge separation with electron injection from ZIF-8 to TiO(2)HNPs, but also more active reaction sites provided by cavity structure of ZIF-8. Overall, this work exemplifies that surface engineering of semiconductors with MOFs is a great strategy to achieve advanced photocatalytic performance for solar energy conversion.

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文献类型: Article

作者关键词: Hybrid photocatalyst; Hollow TiO2 nanospheres; ZIF-8; Hydrogen evolution; TiO2@ZIF-8 nanocomposites

KeyWords Plus: METAL-ORGANIC FRAMEWORKS; ONE-POT SYNTHESIS; VISIBLE-LIGHT; IN-SITU; HYBRID PHOTOCATALYSTS; TIO2 NANOFIBERS; ZIF-8; SURFACE; WATER; NANOSHEETS

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作者: Zou, CN (Zou, Caineng); Zhu, RK (Zhu, Rukai); Chen, ZQ (Chen, Zhong-Qiang); Ogg, JG (Ogg, James G.); Wu, ST (Wu, Songtao); Dong, DZ (Dong, Dazhong); Qiu, Z (Qiu, Zhen); Wang, YM (Wang, Yuman); Wang, L (Wang, Lan); Lin, SH (Lin, Senhu); Cui, JW (Cui, Jingwei); Su, L (Su, Ling); Yang, Z (Yang, Zhi)

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摘要: Organic-matter-rich shales are the main target rocks for unconventional oil and gas exploration and development across the world. In China, shale-gas geological resources are estimated as approximately 110 x 10(12) m(3), with recoverable gas reserves of ca. 20 x 10(12) m(3). Recoverable shale-oil reserves are estimated as ca. 5 x 10(9) t. A total 35 important organic-matter-rich shale units have been recognized from Mesoproterozoic to Cenozoic strata across the entire China. These shales are categorized according to their origin under marine, marine-nonmarine transitional and lacustrine conditions. Shales of marine origin, with ca. 9 x 10(12) m(3) recoverable resources, dominate China's potential in terms of total volume of organic-carbon. Currently, the most favorable marine shales for oil and gas exploration are found in the Sichuan Basin within the lower Cambrian Qiongzhusi Formation and in the Wufeng-Longmaxi formations of uppermost Ordovician through lower Silurian. A fortuitous combination of of sea-level variations, of paleo-productivity, of tectonic activity causing development and migration of partially closed deep basin depocenters, and of sediment accumulation rates controlled the extensive deposition and distribution of organic-matter-rich shales in these Wufeng and Longmaxi formations. Organic-matter-rich shales in marine-nonmarine transitional facies associated with coal measures occur in North China within the Carboniferous and Permian, and in South China within the Permian. These Carboniferous Permian organic-matter-rich shales are important source rocks for the gas fields in the Ordos and Sichuan Basins. Abundant organic-rich shales are also widely distributed within coal-bearing elastics and coal-measure shales of fluvial, lacustrine, and swamp facies in Upper Triassic to Middle Jurassic successions of many basins. Lacustrine organic-rich shales were deposited during the Permian through Neogene in various freshwater to saline lake settings. Lacustrine organic-matter-rich shales are the main oil source rocks in the Songliao, Bohai Bay, Ordos and Junggar basins. Lacustrine algae contributed to the rain of organic matter; and the preservation of organic matter and distribution of organic-rich shale was controlled by lake currents, water depth and oxygen-poor conditions, with enhanced preservation when buried by turbidity currents. Algal blooms were partly induced by trace nutrients from volcanic ash falls in all of these lacustrine basins. Seawater intrusion into the freshwater lake of the Songliao Basin promoted some episodes of black shales. Saline lacustrine basins, such as middle Permian Junggar Basin, contain organic-rich dolomite mudstone that mainly formed during hot climate conditions when the lakes had high salinity and stratified water columns that deprived the bottom waters of oxygen, thereby preserving massive amounts of organic matter. Laminated calcite-rich mudstone in the saline lacustrine settings formed in more brackish waters under stable warm conditions and weak biological activity. The modeling of the factors controlling the distribution of organic-matter-rich shales within China's basins is important for the exploration and development of unconventional oil and gas resources.

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作者关键词: Black shale; Shale oil; Shale gas; Marine; Lacustrine; Formation model; Hydrocarbon exploration; China

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标题: New strategy for designing orangish-redemitting phosphor via oxygen-vacancy-induced electronic localization

作者: Wei, Y (Wei, Yi); Xing, GC (Xing, Gongcheng); Liu, K (Liu, Kang); Li, GG (Li, Guogang); Dang, PP (Dang, Peipei); Liang, SS (Liang, Sisi); Liu, M (Liu, Min); Cheng, ZY (Cheng, Ziyong); Jin, DY (Jin, Dayong); Lin, J (Lin, Jun)

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摘要: Phosphor-converted white-light-emitting diodes (pc-WLED) have been extensively employed as solid-state lighting sources, which have a very important role in people's daily lives. However, due to the scarcity of the red component, it is difficult to realize warm white light efficiently. Hence, red-emitting phosphors are urgently required for improving the illumination quality. In this work, we develop a novel orangish-red La4GeO8:Bi3+ phosphor, the emission peak of which is located at 600 nm under near-ultraviolet (n-UV) light excitation. The full width at half maximum (fwhm) is 103 nm, the internal quantum efficiency (IQE) exceeds 88%, and the external quantum efficiency (EQE) is 69%. According to Rietveld refinement analysis and density functional theory (DFT) calculations, Bi3+ ions randomly occupy all La sites in orthorhombic La4GeO8. Importantly, the oxygen-vacancy-induced electronic localization around the Bi3+ ions is the main reason for the highly efficient orangish-red luminescence. These results provide a new perspective and insight from the local electron structure for designing inorganic phosphor materials that realize the unique luminescence performance of Bi3+ ions.

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标题: Conformal Conducting Polymer Shells on V2O5 Nanosheet Arrays as a High-Rate and Stable Zinc-Ion Battery Cathode

作者: Xu, DM (Xu, Dongming); Wang, HW (Wang, Huanwen); Li, FY (Li, Fuyun); Guan, ZC (Guan, Zhecun); Wang, R (Wang, Rui); He, BB (He, Beibei); Gong, YS (Gong, Yansheng); Hu, XL (Hu, Xianluo)

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摘要: Aqueous zinc-ion batteries (ZIBs) have become research focus because of their cost-effectiveness, high safety, and eco-friendliness. Unfortunately, sluggish Zn2+ diffusion kinetics and the poor cycling stability in cathode materials impede their large-scale application. Herein, V2O5@poly(3,4-ethylenedioxythiophene) (PEDOT) hybrid nanosheet arrays are uniformly deposited on carbon cloth (CC) as a superior ZIB cathode. The as-fabricated V2O5@PEDOT/CC electrode displays a maximum capacity of 360 mAh g(-1) at 0.1 A g(-1). Meanwhile, this hybrid array electrode also shows high rate capability with a specific capacity of 232 mAh g(-1) even at a large current density of 20 A g(-1), and excellent cycling life (97% retention after 600 cycles at 1 A g(-1) and 89% retention after 1000 cycles at 5 A g(-1)). The largely increased Zn-storage performance of the V2O5@PEDOT nanosheet arrays results from the synergistic effects of the two components: the V2O5 nanosheet arrays provide enough Zn-storage active sites, while the PEDOT coating shell increases zinc ion/electron transport kinetics and further acts as a protective layer to restrain structural collapse during cycling.

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作者关键词: cathodes; flexible; nanosheet arrays; PEDOT; V2O5; zinc-ion batteries

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作者: Lv, XW (Lv, Xianwei); Ming, D (Ming, Dongping); Chen, YY (Chen, YangYang); Wang, M (Wang, Min)

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摘要: Pixel-based convolutional neural network (CNN) has demonstrated good performance in the classification of very high resolution images (VHRI) from which abstract deep features are extracted. However, conventional pixel-based CNN demands large resources in terms of processing time and disk space. Therefore, superpixel CNN classification has recently become a focus of attention. We therefore propose a CNN based deep learning method combining superpixels extracted via energy-driven sampling (SEEDS) for VHRI classification. The approach consists of three main steps. First, based on the concept of geographic object-based image analysis (GEOBIA), the image is segmented into homogeneous superpixels using the SEEDS based superpixel segmentation method thereby decreasing the number of processing units. Second, the training data and testing data are extracted from the image and concatenated on a superpixel level at a variety of scales for CNN. Third, the training data are input to train the parameters of CNN and abstract deep features are extracted from the VHRI. Using these extracted deep features, we classify two VHRI data sets at single scales and multiple scales. To verify the effectiveness of SEEDS based CNN classification, the performance of SEEDS and three others superpixel segmentation algorithms are compared, and the superpixel extraction via SEEDS method was found to be the optimal superpixel segmentation approach for CNN classification. The scale effect on CNN classification accuracy was investigated by comparing the four superpixel segmentation methods. We found that (1) There is no strong evidence that using scales combinations is better than a single scale in some specific situations; (2) Natural objects with low complexity are not as sensitive to scale as artificial objects; (3) For a simple VHRI that contains clear artificial objects and simple texture, the classification result with multiple scales performs better a the single scale; (4) In contrast, for the complex VHRI containing a large number of complex objects, the classification result with a single small-scale best.

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作者: Miehe, G (Miehe, Georg); Schleuss, PM (Schleuss, Per-Marten); Seeber, E (Seeber, Elke); Babel, W (Babel, Wolfgang); Biermann, T (Biermann, Tobias); Braendle, M (Braendle, Martin); Chen, FH (Chen, Fahu); Coners, H (Coners, Heinz); Foken, T (Foken, Thomas); Gerken, T (Gerken, Tobias); Graf, HF (Graf, Hans-F.); Guggenberger, G (Guggenberger, Georg); Hafner, S (Hafner, Silke); Holzapfel, M (Holzapfel, Maika); Ingrisch, J (Ingrisch, Johannes); Kuzyakov, Y (Kuzyakov, Yakov); Lai, ZP (Lai, Zhongping); Lehnert, L (Lehnert, Lukas); Leuschner, C (Leuschner, Christoph); Li, XG (Li, Xiaogang); Liu, JQ (Liu, Jianquan); Liu, SB (Liu, Shibin); Ma, YM (Ma, Yaoming); Miehe, S (Miehe, Sabine); Mosbrugger, V (Mosbrugger, Volker); Noltie, HJ (Noltie, Henry J.); Schmidt, J (Schmidt, Joachim); Spielvogel, S (Spielvogel, Sandra); Unteregelsbacher, S (Unteregelsbacher, Sebastian); Wang, Y (Wang, Yun); Willinghofer, S (Willinghoefer, Sandra); Xu, XL (Xu, Xingliang); Yang, YP (Yang, Yongping); Zhang, SR (Zhang, Shuren); Opgenoorth, L (Opgenoorth, Lars); Wesche, K (Wesche, Karsten)

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摘要: With 450,000 km(2) Kobresia (syn. Carex) pygmaea dominated pastures in the eastern Tibetan highlands are the world's largest pastoral alpine ecosystemforming a durable turf cover at 3000-6000 m a.s.l. Kobresia's resilience and competitiveness is based on dwarf habit, predominantly below-ground allocation of photo assimilates, mixture of seed production and clonal growth, and high genetic diversity. Kobresia growth is co-limited by livestock-mediated nutrient withdrawal and, in the drier parts of the plateau, low rainfall during the short and cold growing season. Overstocking has caused pasture degradation and soil deterioration over most parts of the Tibetan highlands and is the basis for this man-made ecosystem. Natural autocyclic processes of turf destruction and soil erosion are initiated through polygonal turf cover cracking, and accelerated by soil-dwelling endemic small mammals in the absence of predators. The major consequences of vegetation cover deterioration include the release of large amounts of C, earlier diurnal formation of clouds, and decreased surface temperatures. These effects decrease the recovery potential of Kobresia pastures and make them more vulnerable to anthropogenic pressure and climate change. Traditional migratory rangeland management was sustainable over millennia, and possibly still offers the best strategy to conserve and possibly increase C stocks in the Kobresia turf. (C) 2018 The Authors. Published by Elsevier B.V.

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摘要: A major breakthrough in shale gas exploration and development has been made concerning the black shale of the Upper Ordovician and Lower Silurian. In recent years, significant progresses have been made regarding the exploration and development of shale gas in the black shale of the Upper Ordovician and Lower Silurian. Accordingly, we investigated the petrological and geochemical characteristics of the black shale from WF2-LM5 graptolite biozones and performed a source analysis of quartz as well as evaluated its effect on shale gas reservoirs. The black shale mainly contains clay, carbonate, and quartz with the average TOC of 2.21%. Three quartz types, Q(1), Q(2), and Q(3), were identified via petrological and cathodoluminescence (CL) analysis. Q(1) of detrital origin as suggested by its typical morphology with monocrystal structure, large grain-size, subrounded to angular outlines, and clear edges. This is further supported by the occurrence of medium luminescence under cathodoluminescence and medium intensity of P-1 and P-2 and high intensity P-3 according to CL images. Q(2) accounts for more than 90% of quartz and exhibits cryptocrystalline texture, an irregular shape, blurring edges, and low luminescence, and its CL images show low intensity P-1, low intensity P-2, and high intensity P-3. Q(3) have the morphologies of siliceous organisms, for example, sponge spicules, radiolaria, and foraminifera. Q(2) and Q(3) belong to authigenic quartz derived from siliceous organisms. Th/U and V/Cr indicate black shale from LM1-3 mainly deposited in the dysoxic-anoxic environment while black shale from LM4-5 deposited in the oxic environment. Authigenic quartz-rich shales from LM1-3 were speculated to be the best shale gas reservoirs characterized by high TOC content, high gas content, and with negligible amount of detrital quartz. Compared with shale from LM1-3, black shale from LM4-5 usually have relatively high detrital quartz content and low TOC content and gas content. Considering the abundant interparticle pore space, the detrital quartz-rich shale interbedded within the black shale from LM4-5, could also become good shale gas reservoirs if sufficient gas supply is guaranteed.

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KeyWords Plus: MISSISSIPPIAN BARNETT SHALE; JURASSIC GORDONDALE MEMBER; FORT-WORTH BASIN; LONGMAXI FORMATION; PORE STRUCTURE; ORDOS BASIN; LITHOFACIES; ORIGIN; WATER; EXPLORATION

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标题: A textile-based SnO2 ultra-flexible electrode for lithium-ion batteries

作者: Min, X (Min, Xin); Sun, B (Sun, Bin); Chen, S (Chen, Shi); Fang, MH (Fang, Minghao); Wu, XW (Wu, Xiaowen); Liu, YG (Liu, Yan'gai); Abdelkader, A (Abdelkader, Amr); Huang, ZH (Huang, Zhaohui); Liu, T (Liu, Tao); Xi, K (Xi, Kai); Kumar, RV (Kumar, R. Vasant)

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摘要: The advancements in wearable electronic devices make it urgent to develop high-performance flexible lithium-ion batteries (LIBs) with excellent mechanical and electrochemical properties. Herein, we design a new 3D hierarchical hybrid sandwich flexible structure by anchoring SnO2 nanosheets (SnO2-NSs) on flexible carbon cloth and coating with thin amorphous carbon (AC) layer (CF@SnO2-NS@AC). The carbon cloth substrate works as the backbone and the current collector, while the thin AC layer provides extra support during the electrode expansion. The new architecture can be utilised as a binder-free electrode and presents extraordinary mechanical flexibility and outstanding electrical stability under external stresses. The new electrode can deliver a specific capacity as high as 968.6 mA h g(-1) after 100 cycles at 85 mA g(-1), which also shows remarkable rate capability and an excellent high current cycling stability. The outstanding electrochemical performances combined with the high mechanical flexibility and invariable electrical conductivity during/after different bending cycles make the new structure a promising oxide anode for flexible batteries. With the possibility of using a similar approach to design flexible cathode, the present work opens the door to empower the next-generation wearable devices and smart clothes with a robust and reliable battery.

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作者关键词: Wearable devices; Flexible lithium-ion batteries; Tin dioxide; 3D hierarchical structure; Nanosheet; Textile anode

KeyWords Plus: HIGH-PERFORMANCE LITHIUM; BINDER-FREE ELECTRODE; LI-ION; MESOPOROUS SNO2; RAMAN-SPECTROSCOPY; ANODE MATERIALS; SODIUM-ION; CURRENT COLLECTORS; CARBON NANOFIBERS; RATE CAPABILITY

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标题: Mine Fracturing Monitoring Analysis Based on High-Precision Distributed Wireless Microseismic Acquisition Station

作者: Qiao, SQ (Qiao, Shuaiqing); Zhang, QS (Zhang, Qisheng); Zhang, QM (Zhang, Qimao)

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摘要: A large number of shallow fossil fuel energy sources have been exhausted, including coal, oil, natural gas, and other non-renewable energy sources with rapid industrial development. The mining of fossil fuel energy has gradually shifted to the deep layers of the stratum, where safety is more difficult to guarantee. As a result, the development of a data acquisition system that can be used for microseismic monitoring and disaster prediction is imminent. In this study, in order to complete the design of a high-precision acquisition circuit, main control circuit, and other hardware circuits, the authors developed a set of high-precision distributed wireless microseismic acquisition stations, which was combined with three-component geophones to complete a microseismic monitoring system. This monitoring system was then verified through on-site work during the construction of a coal mine in China. This paper focuses on a detailed analysis of the data collected by the acquisition stations. Firstly, twelve sets of acquisition stations were used to conduct fixed-location blasting tests of the mine, which yielded good test results. Secondly, an analysis of microseismic monitoring data obtained during deep-well fracturing was carried out, and pre-fracturing static monitoring, carbon dioxide monitoring, fracturing monitoring, and post-fracturing static monitoring were also completed. This paper provides a detailed introduction to fracturing monitoring data of mines, combining discussions on the other three types of mine monitoring to reach relevant conclusions.

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标题: Permian integrative stratigraphy and timescale of China

作者: Shen, SZ (Shen, Shuzhong); Zhang, H (Zhang, Hua); Zhang, YC (Zhang, Yichun); Yuan, DX (Yuan, Dongxun); Chen, B (Chen, Bo); He, WH (He, Weihong); Mu, L (Mu, Lin); Lin, W (Lin, Wei); Wang, WQ (Wang, Wenqian); Chen, J (Chen, Jun); Wu, Q (Wu, Qiong); Cao, CQ (Cao, Changqun); Wang, Y (Wang, Yue); Wang, XD (Wang, Xiangdong)

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摘要: A series of global major geological and biological events occurred during the Permian Period. Establishing a highresolution stratigraphic and temporal framework is essential to understand their cause-effect relationship. The official International timescale of the Permian System consists of three series (i.e., Cisuralian, Guadalupian and Lopingian in ascending order) and nine stages. In China, the Permian System is composed of three series (Chuanshanian, Yansingian and Lopingian) and eight stages, of which the subdivisions and definitions of the Chuanshanian and Yangsingian series are very different from the Cisuralian and Guadalupian series. The Permian Period spanned approximate to 47 Myr. Its base is defined by the First Appearance Datum (FAD) of the conodont Streptognathodus isolatus at Aidaralash, Kazakhstan with an interpolated absolute age 298.9 +/- 0.15 Ma at Usolka, southern Urals, Russia. Its top equals the base of the Triassic System and is defined by the FAD of the conodont Hindeodus parvus at Meishan D section, southeast China with an interpolated absolute age 251.902 +/- 0.024 Ma. Thirty-five conodont, 23 fusulinid, 17 radiolarian and 20 ammonoid zones are established for the Permian in China, of which the Guadalupian and Lopingian conodont zones have been served as the standard for international correlation. The Permian C-13(carb) trend indicates that it is characterized by a rapid negative shift of 3-5 parts per thousand at the end of the Changhsingian, which can be used for global correlation of the end-Permian mass extinction interval, but C-13(carb) records from all other intervals may have more or less suffered subsequent diagenetic alteration or represented regional or local signatures only. Permian O-18{ainpatite} studies suggest that an icehouse stage dominated the time interval from the late Carboniferous to Kungurian (late Cisuralian). However, paleoclimate began to ameriolate during the late Kungurian and gradually shifted into a greenhouse-dominated stage during the Guadalupian. The Changhsingian was a relatively cool stage, followed by a globally-recognizable rapid temperature rise of 8-10 degrees C at the very end of the Changhsingian. The Sr-87/Sr-86 ratio trend shows that their values at the beginning of the Permian were between 0.70800, then gradually decreased to the late Capitanian minimum 0.70680-0.70690, followed by a persistent increase until the end of the Permian with the value 0.70708. Magenetostratigraphy suggests two distinct stages separated by the Illawarra Reversal in the middle Wordian, of which the lower is the reverse polarity Kiaman Superchron and the upper is the mixed-polarity Illawarra Superchron. The end-Guadalupian (or pre-Lopingian) biological crisis occurred during the late Capitanian, when faunal changeovers of different fossil groups had different paces, but generally experienced a relatively long time from the Jinogondolella altudensis Zone until the earliest Wuchiapingian. The end-Permian mass extinction was a catastrophic event that is best constrained at the Meishan section, which occurred at 251.941 +/- 0.037 Ma and persisted no more than 61 +/- 48 kyr. After the major pulse at Bed 25, the extinction patterns are displayed differently in different sections. The global end-Guadalupian regression is manifested between the conodont Jinogondolella xuanhanensis and Clarkina dukouensis zones and the end-Changhsingian transgression began in the Hindeodus changxingensis-Clarkina zhejiangensis Zone.

The Permian Period is also characterized by strong faunal provincialism in general, which resulted in difficulties in inter-continental and inter-regional correlation of both marine and terrestrial systems.

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作者关键词: Permian; timescale; global correlation; biostratigraphy; chemostratigraphy

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标题: Sampled-data-based dissipative control of T-S fuzzy systems

作者: Zeng, HB (Zeng, Hong-Bing); Teo, KL (Teo, Kok Lay); He, Y (He, Yong); Wang, W (Wang, Wei)

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摘要: This paper investigates the problem of sampled-data-based dissipative control of Takagi-Sugeno (T-S) fuzzy systems. The sampling period is assumed to be varying within an interval. By making full use of realistic information about the whole sampling interval, we propose a novel complete sampling-interval-dependent looped function, which depends not only on the interval from x(t) to x(t(k)) but also on the interval from x(t) to x(t(k+1)). Based on this function, a sufficient condition is established, ensuring the considered system strictly (Q, S, R) - gamma-dissipative. Furthermore, a approach to design desired sampled-data controllers is proposed. It is applied to solve the problems of a truck-trailer and an inverted pendulum. From the results obtained, we see that this approach is highly effective. (C) 2018 Elsevier Inc. All rights reserved.

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作者关键词: Fuzzy systems; Dissipative control; Sampled-data control; Looped function

KeyWords Plus: H-INFINITY CONTROL; STABILITY ANALYSIS; NONLINEAR-SYSTEMS; LINEAR-SYSTEMS; TIME-DELAY; NEURAL-NETWORKS; FAULT-DETECTION; STABILIZATION; MODEL; SYNCHRONIZATION

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标题: Improving NoSQL Storage Schema Based on Z-Curve for Spatial Vector Data

作者: Zhang, DF (Zhang, Dongfang); Wang, Y (Wang, Yong); Liu, ZL (Liu, Zhenling); Dai, SJ (Dai, Shijie)

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摘要: NoSQL database can provide massive, high concurrency, and scalable services for storing different types of data. HBase, a type of NoSQL database, in which columns are grouped into column families, is very suitable for storing semi-structured or unstructured spatial vector data. However, since there are few rules and constraints to be followed for the NoSQL database, the design of storage schema for spatial data based on NoSQL is difficult. In this paper, based on our early work, an improved Z-curve storage schema is proposed for spatial vector data. According to our new schema, row key of a geometric object is the Z-curve code of the spatial grids intersected with the geometric object. Moreover, geometric objects with the same row key are stored in a column family. Our proposed method has two features. First, geometric objects adjacent in the location are adjacent in physical storage. Second, redundant exists in storage for improving query accuracy. In our experiments, we compare the improved Z-curve storage schema with a Quadtree storage schema, an R-tree storage schema, and the previous Z-curve storage schema. Query response time, memory usage, and the query accuracy of spatial query on point and range are used to verify the validity of our proposed method. The experimental results show that the two storage schemas based on Z-curve achieve higher query efficiency than the two storage schemas based on tree-the Quadtree storage schema and the R-tree storage schema. More importantly, the query results of the improved Z-curve schema are completely correct, while the query results of the previous Z-curve schema are not.

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标题: Overview of recent advances in stability of linear systems with time-varying delays

作者: Zhang, XM (Zhang, Xian-Ming); Han, QL (Han, Qing-Long); Seuret, A (Seuret, Alexandre); Gouaisbaut, F (Gouaisbaut, Frederic); He, Y (He, Yong)

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摘要: This study provides an overview and in-depth analysis of recent advances in stability of linear systems with time-varying delays. First, recent developments of a delay convex analysis approach, a reciprocally convex approach and the construction of Lyapunov-Krasovskii functionals are reviewed insightfully. Second, in-depth analysis of the Bessel-Legendre inequality and some affine integral inequalities is made, and recent stability results are also summarised, including stability criteria for three cases of a time-varying delay, where information on the bounds of the time-varying delay and its derivative is totally known, partly known and completely unknown, respectively. Third, a number of stability criteria are developed for the above three cases of the time-varying delay by employing canonical Bessel-Legendre inequalities, together with augmented Lyapunov-Krasovskii functionals. It is shown through numerical examples that these stability criteria outperform some existing results. Finally, several challenging issues are pointed out to direct the near future research.

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作者关键词: delay systems; time-varying systems; delays; linear systems; Lyapunov methods; stability criteria; linear systems; delay convex analysis approach; stability criteria; canonical Bessel-Legendre inequalities; time-varying delays; reciprocally convex approach; augmented Lyapunov-Krasovskii functionals

KeyWords Plus: H-INFINITY CONTROL; GLOBAL ASYMPTOTIC STABILITY; LYAPUNOV-KRASOVSKII FUNCTIONALS; DEPENDENT ROBUST STABILITY; NEURAL-NETWORKS; SUMMATION INEQUALITIES; INTEGRAL-INEQUALITIES; MODEL TRANSFORMATIONS; ADDITIONAL DYNAMICS; COOPERATIVE CONTROL

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标题: Satellite Remote Sensing of Surface Urban Heat Islands: Progress, Challenges, and Perspectives

作者: Zhou, DC (Zhou, Decheng); Xiao, JF (Xiao, Jingfeng); Bonafoni, S (Bonafoni, Stefania); Berger, C (Berger, Christian); Deilami, K (Deilami, Kaveh); Zhou, YY (Zhou, Yuyu); Frolking, S (Frolking, Steve); Yao, R (Yao, Rui); Qiao, Z (Qiao, Zhi); Sobrino, JA (Sobrino, Jose A.)

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摘要: The surface urban heat island (SUHI), which represents the difference of land surface temperature (LST) in urban relativity to neighboring non-urban surfaces, is usually measured using satellite LST data. Over the last few decades, advancements of remote sensing along with spatial science have considerably increased the number and quality of SUHI studies that form the major body of the urban heat island (UHI) literature. This paper provides a systematic review of satellite-based SUHI studies, from their origin in 1972 to the present. We find an exponentially increasing trend of SUHI research since 2005, with clear preferences for geographic areas, time of day, seasons, research foci, and platforms/sensors. The most frequently studied region and time period of research are China and summer daytime, respectively. Nearly two-thirds of the studies focus on the SUHI/LST variability at a local scale. The Landsat Thematic Mapper (TM)/Enhanced Thematic Mapper (ETM+)/Thermal Infrared Sensor (TIRS) and Terra/Aqua Moderate Resolution Imaging Spectroradiometer (MODIS) are the two most commonly-used satellite sensors and account for about 78% of the total publications. We systematically reviewed the main satellite/sensors, methods, key findings, and challenges of the SUHI research. Previous studies confirm that the large spatial (local to global scales) and temporal (diurnal, seasonal, and inter-annual) variations of SUHI are contributed by a variety of factors such as impervious surface area, vegetation cover, landscape structure, albedo, and climate. However, applications of SUHI research are largely impeded by a series of data and methodological limitations. Lastly, we propose key potential directions and opportunities for future efforts. Besides improving the quality and quantity of LST data, more attention should be focused on understudied regions/cities, methods to examine SUHI intensity, inter-annual variability and long-term trends of SUHI, scaling issues of SUHI, the relationship between surface and subsurface UHIs, and the integration of remote sensing with field observations and numeric modeling.

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文献类型: Review

作者关键词: thermal remote sensing; land surface temperature; urban heat island; urbanization; review; impervious surface; MODIS; Landsat; ASTER; heat waves

KeyWords Plus: REFLECTION RADIOMETER ASTER; SPACEBORNE THERMAL EMISSION; IN-SITU MEASUREMENTS; IMAGE-BASED ANALYSIS; LAND-COVER PATTERN; LANDSCAPE PATTERN; AIR-TEMPERATURE; TEMPORAL TRENDS; SPATIAL-PATTERN; CLIMATE-CHANGE

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标题: A high-performance Bi2O3/Bi2SiO5 p-n heterojunction photocatalyst induced by phase transition of Bi2O3

作者: Lu, HJ (Lu, Haojie); Hao, Q (Hao, Qiang); Chen, T (Chen, Tong); Zhang, LH (Zhang, Linghua); Chen, DM (Chen, Daimei); Ma, C (Ma, Chao); Yao, WQ (Yao, Wenqing); Zhu, YF (Zhu, Yongfa)

来源出版物: APPLIED CATALYSIS B-ENVIRONMENTAL 卷: 237 页: 59-67 DOI: 10.1016/j.apcatb.2018.05.069 出版年: DEC 5 2018

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摘要: In this work, Bi2O3/Bi2SiO5 p-n heterojunction photocatalyst was successfully fabricated via a facile one-step synthesis using Bi(NO3)(3) and nano-SiO2 as precursors. With the increasing amount of SiO2, alpha-Bi2O3 gradually transferred into beta-Bi2O3, and Bi2O3/Bi2SiO5 p-n heterojunction was obtained at the same time. The as-prepared samples were systematically characterized by XRD, scanning electron microscopy (SEM), energy-dispersive spectrometry (EDS), transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), UV-vis diffuse reflectance spectroscopy (DRS). The Bi2O3/Bi2SiO5 heterojunction photocatalysts exhibited higher photocatalytic activity than alpha-Bi2O3 on the degradation of organic pollutants under simulated sunlight irradiation. The enhanced photocatalytic activity could be ascribed to the larger specific surface area, the larger contact angle, the formation of beta-Bi2O3 and construction of p-n heterojunction. More importantly, the phase transition mechanism of Bi2O3 in Bi2O3/Bi2SiO5 heterojunction photocatalyst was proposed, which is significant for the theoretical study and application of photocatalytic materials.

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作者关键词: Bi2O3/Bi2SiO5 heterojunction; Photocatalysts; beta-Bi2O3

KeyWords Plus: DEGRADATION; FABRICATION; NANOSHEETS; COMPOSITE; EFFICIENCY; BIVO4; SIO2; BR

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标题: Shale gas transport model in 3D fractal porous media with variable pore sizes

作者: Cai, JC (Cai, Jianchao); Lin, DL (Lin, Duanlin); Singh, H (Singh, Harpreet); Wei, W (Wei, Wei); Zhou, SW (Zhou, Shangwen)

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摘要: A model for gas transport in shale is proposed by accounting for three major fluid flow mechanisms in shale stratum, which is modeled as a 3D fractal media. The proposed apparent permeability of shale is an analytical expression that also accounts for heterogeneous pore sizes in shale stratum, and is verified using experimental datasets for methane and helium flow in shale. Results of sensitivity analysis indicate that surface diffusion of adsorbed gas plays an important role, specifically in smaller pores, while surface diffusion would be negligible in larger pores. Further, the proposed model shows that flow due to surface diffusion decreases moderately with the increase of isosteric adsorption heat, while it increases significantly with the increase of the maximum adsorption capacity. One of the key novelties of the proposed permeability model is that it accounts for pore size distribution to reveal novel insights on gas transport in shale that can be used to optimize gas production by operational controls (e.g. controlling reservoir pressure) as flow regimes change with time.

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作者关键词: Shale gas; Fractal porous media; Three-dimensional structure; Pore size distribution; Gas permeability

KeyWords Plus: KOZENY-CARMAN CONSTANT; APPARENT PERMEABILITY; SURFACE-DIFFUSION; SPONTANEOUS IMBIBITION; SLIPPAGE FACTOR; ADSORBED GAS; FLOW; NANOPORES; MULTISCALE; RESERVOIRS

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标题: Neoproterozoic magmatism in the western and northern margins of the Yangtze Block (South China) controlled by slab subduction and subduction-transform-edge-propagator

作者: Zhao, JH (Zhao Jun-Hong); Li, QW (Li Qi-Wei); Liu, H (Liu Hang); Wang, W (Wang Wei)

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摘要: The South China Craton consists of the Yangtze and Cathaysia blocks that were welded together along the Jiangnan Fold Belt in the Neoproterozoic. The Neoproterozoic magmatism in the western and northern margins of the Yangtze Block is characterized by voluminous volcano-sedimentary strata, numerous felsic intrusions and many mafic-ultramafic plutons which provide a good opportunity to examine the geodynamics and tectonic evolution of the South China Craton during the assembly and breakup of Rodinia. Based on the geochronological and geochemical data, our study shows that the Neoproterozoic igneous rocks in the western and northern margins of the Yangtze Block were formed in subduction- and rift-related tectonic settings, respectively.

In the western margin of the Yangtze Block, the Neoproterozoic mafic and ultramafic rocks show arc-affinity trace elemental compositions that are indicative of mantle sources enriched by slab fluids. High-delta O-18 mafic rocks (850-780 Ma) were derived from mantle wedges that were modified by sediment melts, whereas low-delta O-18 mafic rocks (750-740 Ma) were formed by partial melting of mantle sources further enriched by altered oceanic crust melts. The widespread talc-alkaline I-type granitoids in this region, generated between 870 and 750 Ma, show negative to positive whole rock eNd (- 4.9 to + 4.8) and variable zircon eHf values (- 1.9 to + 10.6), similar to those of the contemporary mafic-ultramafic rocks, suggesting that they were produced by melting of the juvenile crust. The 780-750 Ma adakitic granitoids are characterized by high Sr/Y (19-318) and low Y (1.78-17.9 ppm) and have relatively constant eNd (- 2.1 to + 2.9) and eHf ( + 4.3 to + 7.1) and mantle-like 8180 values (3.40 parts per thousand to 6.86 parts per thousand), suggesting that they were partial melts of a subducted oceanic slab. These three types of igneous rocks demonstrate that the Neoproterozoic magmatism in the western margin of the Yangtze Block was controlled by a continuous subduction system.

However, Neoproterozoic magmatism in the South Qinling Belt at the northern margin of the Yangtze Block generated both arc- and rift-related igneous rocks. The arc-like mafic-ultramafic rocks are thought to have been derived from a subduction-modified lithospheric mantle source, whereas the MORB-affinity mafic rocks were probably sourced from an asthenosphere mantle. Associated Neoproterozoic granitoids were produced by melting of the juvenile mafic crust, except minor felsic rocks derived from the ancient basement. Widespread 800-700 Ma volcano-sedimentary sequences and 650 Ma mafic dike swarms suggest an extensional environment. Neoproterozoic magmatic zircons from felsic volcanic rocks and HP/UHP metamorphic rocks preserve low-delta O-18 values that were inherited from their protolith which underwent high temperature hydrothermal interaction in a rift setting. On the basis of these observations, the Neoproterozoic magmatism in the South Qinling Belt is proposed to have been controlled by a subduction-transform edge propagator (STEP) in relation to the continuous subduction system at the western margin of the Yangtze Block.

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KeyWords Plus: ZIRCON U-PB; QINLING OROGENIC BELT; HF ISOTOPIC COMPOSITION; A-TYPE GRANITE; EARLY CRUSTAL EVOLUTION; I-TYPE GRANITE; TECTONIC EVOLUTION; DETRITAL ZIRCON; SICHUAN PROVINCE; GEOCHEMICAL EVIDENCE

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标题: Thickness-Dependent Facet Junction Control of Layered BiOIO3 Single Crystals for Highly Efficient CO2 Photoreduction

作者: Chen, F (Chen, Fang); Huang, HW (Huang, Hongwei); Ye, LQ (Ye, Liqun); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe); Han, XP (Han, Xiaopeng); Ma, TY (Ma, Tianyi)

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摘要: Thin layer fabrication and crystal facet engineering favor the prompt charge transfer from bulk to the surface of a material and spatial charge separation among different facets, tremendously benefitting photocatalytic activity. However, the thickness and surface facet composition are considered as two entwined characteristics of layered materials with well-defined and tunable shapes, which possess great promise to achieve the simultaneous manipulation of charge transfer and spatial separation. Herein, it is demonstrated that one solution for the aforementioned issue by controllably regulating the surface {010}/{100} facet junctions of a layered thickness-tunable bismuth-based material, BiOIO3. The attenuation in thickness of BiOIO3 nanoplates shortens the diffusion pathway of charge carriers, and more importantly the tuning of nanolayer thickness renders the ratio variation of the top {010} facet to the lateral {100} facet, which dominates the spatial separation of photogenerated electrons and holes. As a result, the highest CO evolution rate from CO2 reduction over BiOIO3 nanoplates with the optimal thickness and ratio of exposed facets reaches 5.42 mu mol g(-1) h(-1), over 300% that of the bulk counterpart (1.77 mu mol g(-1) h(-1)). This work paves a new way for governing charge movement behaviors on the basis of the synergistic engineering of layer structure and exposing facets.

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作者关键词: bismuth-based materials; charge separation; CO2 reduction; photocatalysis

KeyWords Plus: PHOTOCATALYTIC REDUCTION; ANATASE TIO2; CHARGE SEPARATION; NANOSHEETS; ELECTRON; BIVO4; BIOCL

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标题: Palladium Phosphide as a Stable and Efficient Electrocatalyst for Overall Water Splitting

作者: Luo, F (Luo, Fang); Zhang, Q (Zhang, Quan); Yu, XX (Yu, Xinxin); Xiao, SL (Xiao, Shenglin); Ling, Y (Ling, Ying); Hu, H (Hu, Hao); Guo, L (Guo, Long); Yang, ZH (Yang, Zehui); Huang, L (Huang, Liang); Cai, WW (Cai, Weiwei); Cheng, HS (Cheng, Hansong)

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摘要: A palladium phosphide electrocatalyst supported on carbon black (PdP2@CB) shows efficient water splitting in both alkaline and neutral electrolytes. Significantly lower overpotentials are required for PdP2@CB (27.5 mV in 0.5 m H2SO4; 35.4 mV in 1m KOH; 84.6 mV in 1 m PBS) to achieve a HER electrocatalytic current density of 10mAcm(-2) compared to commercial Pt/CB (30.1 mV in 0.5 m H2SO4; 46.6 mV in 1 m KOH; 122.7 mV in 1 m PBS). Moreover, no loss in HER activity is detectable after 5000 potential sweeps. Only 270 mV and 277 mV overpotentials are required to reach a current density of 10mAcm(-2) for PdP2@CB to catalyze OER in 1m KOH and 1m PBS electrolytes, which is better OER activity than the benchmark IrO2 electrocatalyst (301 mV and 313 mV to drive a current density of 10 mA cm(-2)). 1.59V and 1.72 V are needed for PdP2@CB to achieve stable water splitting catalytic current density of 10mAcm(-2) in 1m PBS and 50 mA cm(-2) in 1m KOH for 10 h, respectively.

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作者关键词: hydrogen evolution reaction; oxygen evolution reaction; palladium phosphide; water splitting

KeyWords Plus: HYDROGEN EVOLUTION REACTION; HIGHLY EFFICIENT; OXYGEN EVOLUTION; CARBON CLOTH; BIFUNCTIONAL ELECTROCATALYST; MOLYBDENUM CARBIDE; FACILE SYNTHESIS; NICKEL FOAM; CATALYST; NANOPARTICLES

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标题: East Asian hydroclimate modulated by the position of the westerlies during Termination I

作者: Zhang, HB (Zhang, Hongbin); Griffiths, ML (Griffiths, Michael L.); Chiang, JCH (Chiang, John C. H.); Kong, WW (Kong, Wenwen); Wu, ST (Wu, Shitou); Atwood, A (Atwood, Alyssa); Huang, JH (Huang, Junhua); Cheng, H (Cheng, Hai); Ning, YF (Ning, Youfeng); Xie, SC (Xie, Shucheng)

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摘要: Speleothem oxygen isotope records have revolutionized our understanding of the paleo East Asian monsoon, yet there is fundamental disagreement on what they represent in terms of the hydroclimate changes. We report a multiproxy speleothem record of monsoon evolution during the last deglaciation from the middle Yangtze region, which indicates a wetter central eastern China during North Atlantic cooling episodes, despite the oxygen isotopic record suggesting a weaker monsoon. We show that this apparent contradiction can be resolved if the changes are interpreted as a lengthening of the Meiyu rains and shortened post-Meiyu stage, in accordance with a recent hypothesis. Model simulations support this interpretation and further reveal the role of the westerlies in communicating the North Atlantic influence to the East Asian climate.

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KeyWords Plus: SUMMER MONSOON PRECIPITATION; NORTH-ATLANTIC CLIMATE; ICE-AGE TERMINATIONS; SEASONAL TRANSITIONS; LAST DEGLACIATION; TRACE-ELEMENT; TIBETAN PLATEAU; INDIAN MONSOON; CAVE RECORDS; VARIABILITY

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标题: Reconstructing South China in Phanerozoic and Precambrian supercontinents

作者: Cawood, PA (Cawood, Peter A.); Zhao, GC (Zhao, Guochun); Yao, JL (Yao, Jinlong); Wang, W (Wang, Wei); Xu, YJ (Xu, Yajun); Wang, YJ (Wang, Yuejun)

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摘要: The history of the South China Craton and the constituent Yangtze and Cathaysia blocks are directly linked to Earth's Phanerozoic and Precambrian record of supercontinent assembly and dispersal. Exposed Archean rocks are limited to isolated fragments in the Yangtze Block that preserve a record of Meso- to Neo-Archean magmatism, sedimentation and metamorphism associated with a period of global craton formation and stabilization that corresponds with the assembly of the Kenor supercontinent/supercraton. However, there are insufficient data to link its history with other similar aged cratons. The tectonostratigraphic record in South China in the Paleoproterozoic, corresponding with the assembly of Nuna, suggests that rock units in the Yangtze Block were spatially linked with northwestern Laurentia and possibly Siberia, whereas Cathaysia was joined to northern India. During the formation of Rodinia at the end of the Mesoproterozoic through to that of Pangea in the mid-Paleozoic, Cathaysia remained joined to northern India. Early Neoproterozoic supra-subduction zone magmatic arc-back arc assemblages ranging in age from similar to 1000 Ma to 810 Ma occur within Cathaysia, along its northwestern margin, and along the southeastern margin of the Yangtze Block. These rocks provide a record of convergent plate interaction, which continued along the western margin of the Yangtze Block until around 700 Ma and correlates with similar along strike subduction zone magmatism in northwest India, Seychelles and Madagascar. During the final assembly of Gondwana in the early Paleozoic suturing of India-South China with the Western Australia-Mawson blocks along the Kuunga Orogen resulted in the accretion of the Sanya Block of Hainan Island with the rest of Cathaysia. The accretion of Laurussia to Gondwana in the mid-Paleozoic to form Pangea corresponds with the initiation of lithospheric extension along the northern margin of Gondwana and the separation of a number of continental blocks, including South China, which then drifted northward across the Paleo-Tethys to collide with the Asian segment of Pangea in the Permo-Triassic.

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KeyWords Plus: ZIRCON U-PB; NEOPROTEROZOIC TECTONIC EVOLUTION; SOUTHEASTERN YANGTZE BLOCK; JIANGNAN OROGENIC BELT; MESOPROTEROZOIC DONGCHUAN GROUP; ARCHEAN CRUSTAL EVOLUTION; HF ISOTOPIC CONSTRAINTS; BIMODAL VOLCANIC-ROCKS; LARGE IGNEOUS PROVINCE; BACK-ARC SYSTEM

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标题: A semi-supervised generative framework with deep learning features for high-resolution remote sensing image scene classification

作者: Han, W (Han, Wei); Feng, RY (Feng, Ruyi); Wang, LZ (Wang, Lizhe); Cheng, YF (Cheng, Yafan)

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摘要: High resolution remote sensing (HRRS) image scene classification plays a crucial role in a wide range of applications and has been receiving significant attention. Recently, remarkable efforts have been made to develop a variety of approaches for HRRS scene classification, wherein deep-learning-based methods have achieved considerable performance in comparison with state-of-the-art methods. However, the deep-learning-based methods have faced a severe limitation that a great number of manually annotated HRRS samples are needed to obtain a reliable model. However, there are still not sufficient annotation datasets in the field of remote sensing. In addition, it is a challenge to get a large scale HRRS image dataset due to the abundant diversities and variations in HRRS images. In order to address the problem, we propose a semi-supervised generative framework (SSGF), which combines the deep learning features, a self-label technique, and a discriminative evaluation method to complete the task of scene classification and annotating datasets. On this basis, we further develop an extended algorithm (SSGA-E) and evaluate it by exclusive experiments. The experimental results show that the SSGA-E outperforms most of the fully-supervised methods and semi-supervised methods. It has achieved the third best accuracy on the UCM dataset, the second best accuracy on the WHU-RS, the NWPU-RESISC45, and the AID datasets. The impressive results demonstrate that the proposed SSGF and the extended method is effective to solve the problem of lacking an annotated HRRS dataset, which can learn valuable information from unlabeled samples to improve classification ability and obtain a reliable annotation dataset for supervised learning. (C) 2017 International Society for Photogrammetry and Remote Sensing, Inc. (ISPRS). Published by Elsevier B.V. All rights reserved.

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KeyWords Plus: OBJECT DETECTION; REPRESENTATION; SET

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标题: Rational design of phosphorescent iridium(III) complexes for emission color tunability and their applications in OLEDs

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摘要: This review is an update on recent developments in emissive iridium(III) phosphorescent complexes and their applications in organic light-emitting diodes (OLEDs). The emphasis is focused on complexes with emission colors spanning the whole visible spectral region, which is extremely important for applications of OLEDs in display and white-light luminance. In each color section, materials are classified according to their coordination configuration, including homoleptic, heteroleptic and tridentate, trying to clarify the relationship between the molecular structure and the photophysical properties. Since the emission color, photoluminescence efficiency and carrier mobility of the phosphors are critical for device performances, we endeavor to dig out these values along with the measuring methods from the publications, and rational chemical modifications aiming for high efficiency and carrier mobility with different colors are also discussed. (C) 2018 Elsevier B.V. All rights reserved.

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作者: Wang, YJ (Wang, Yuejun); Qian, X (Qian, Xin); Cawood, PA (Cawood, Peter A.); Liu, HC (Liu, Huichuan); Feng, QL (Feng, Qinglai); Zhao, GC (Zhao, Guochun); Zhang, YH (Zhang, Yanhua); He, HY (He, Huiying); Zhang, PZ (Zhang, Peizhen)

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摘要: The Phanerozoic record of Southeast Asia preserves the history of opening and subsequent consumption of the Paleotethyan Ocean and the assembly of continental fragments into Asia as part of the broader-scale reconstruction of Pangea. However, uncertainty remains as to which of the many suture zones in Southeast Asia represents the relict of the main ocean, when final ocean closure occurred, and the assembly history of the Eastern Cimmerian and Southeast Asia continental fragments. Our overview of the geological features of the suture zones, the bounding continental fragments and their magmatic, metamorphic and sedimentary records resolves many of these key issues. The sedimentary, biogeographical, structural, lithological, geochemical and geochronological data from the Changning-Menglian, Inthanon and Bentong-Raub suture zones argue for their linkage with the Longmu Co-Shuanghu suture zone in Central Tibet, and together constitute the main East Paleotethyan Ocean relict. The eastward subduction of the ocean resulted in the development of a series of magmatic arc-back-arc basin and continental fragments in Southeast Asia, including, from west to east, the Lincang-Sukhothai-East Malaya arc, the Jinghong-Nan-Sa Kaeo back-arc basin, the Simao/west Indochina fragment, the Luang Prabang-Loei back-arc basin, the south Indochina fragment, the Wusu and Truong Son back arc basins, the north Indochina fragment, the Jinshajiang-Ailaoshan-Song Ma branch/back-arc basin and the South China Block. Assembly of these fragments resulted in Indosinian high temperature and high pressure metamorphism and related tectonothermal event. Available data indicate a switch from subduction of the main East Paleotethyan Ocean to the collision of the Sibumasu with Simao/Indochina blocks at similar to 237 Ma, with subsequent syn- and post-collisional events at similar to 237-230 Ma and similar to 230-200 Ma, respectively, along the Changning-Menglian, Inthanon and Bentong-Raub suture zones. The timing of initial-, syn- and post-collision events along the Jinshajiang-Ailaoshan-Song Ma suture zone with its record of back-arc basin closure is at similar to 247 Ma, similar to 247-237 Ma and similar to 237-200 Ma, generally similar to 10 Ma older than that along the Changning-Menglian, Inthanon and Bentong-Raub suture zones. Our synthesis of all available data enables establishment of a comprehensive geodynamic model for the East Paleotethyan evolution. This model links the spatial-temporal pattern across Southeast Asia into a series of tectonic events including ocean/back-arc basin opening, subduction/closure, subsequent assemblage and orogenic collapse, along with associated igneous, metamorphic and sedimentary activities.

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摘要: Continental breakup represents the successful process of rifting and thinning of the continental lithosphere, leading to plate rupture and initiation of oceanic crust formation. Magmatism during breakup seems to follow a path of either excessive, transient magmatism (magma-rich margins) or of igneous starvation (magma-poor margins). The latter type is characterized by extreme continental lithospheric extension and mantle exhumation prior to igneous oceanic crust formation. Discovery of magma-poor margins has raised fundamental questions about the onset of ocean-floor type magmatism, and has guided interpretation of seismic data across many rifted margins, including the highly extended northern South China Sea margin. Here we report International Ocean Discovery Program drilling data from the northern South China Sea margin, testing the magma-poor margin model outside the North Atlantic. Contrary to expectations, results show initiation of Mid-Ocean Ridge basalt type magmatism during breakup, with a narrow and rapid transition into igneous oceanic crust. Coring and seismic data suggest that fast lithospheric extension without mantle exhumation generated a margin structure between the two endmembers. Asthenospheric upwelling yielding Mid-Ocean Ridge basalt-type magmatism from normal-temperature mantle during final breakup is interpreted to reflect rapid rifting within thin pre-rift lithosphere.

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摘要: Zeolitic imidazole frameworks (ZIFs) offer rich platforms for rational design and construction of high-performance nonprecious-metal oxygen reduction reaction (ORR) catalysts owing to their flexibility, hierarchical porous structures, and high surface area. Herein, an Fe, Cu-coordinated ZIF-derived carbon framework (Cu@Fe-N-C) with a well-defined morphology of truncated rhombic dodecahedron is facilely prepared by introducing Fe2+ and Cu2+ during the growth of ZIF-8, followed by pyrolysis. The obtained Cu@Fe-N-C, with bimetallic active sites, large surface area, high nitrogen doping level, and conductive carbon frameworks, exhibits excellent ORR performance. It displays 50 mV higher half-wave potential (0.892 V) than that of Pt catalysts in an alkaline medium and comparable performance to Pt catalysts in an acidic medium. In addition, it also has excellent durability and methanol resistance ability in both acidic and alkaline solutions, which makes it one of the best Pt-free catalysts reported to date for ORR. Impressively, when being employed as a cathode catalyst in zinc-air batteries, Cu@Fe-N-C presents a higher peak power density of 92 mW cm(-2) than that of Pt/C (74 mW cm(-2)) as well as excellent durability.

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作者关键词: Fe-Cu coordination; oxygen reduction reaction; zinc-air batteries

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标题: Activation of amorphous Bi2WO6 with synchronous Bi metal and Bi2O3 coupling: Photocatalysis mechanism and reaction pathway

作者: He, WJ (He, Wenjie); Sun, YJ (Sun, Yanjun); Jiang, GM (Jiang, Guangming); Huang, HW (Huang, Hongwei); Zhang, XM (Zhang, Xianming); Dong, F (Dong, Fan)

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摘要: Amorphous semiconductors usually suffer from low photocatalysis efficiency due to the fast charge recombination rate. In this work, to activate the amorphous Bi2WO6, Bi2O3 and Bi particles were in sequence deposited over its surface via a facile in situ chemical reduction of amorphous Bi2WO6 by NaBH4 at room temperature. In the resultant ternary Bi/Bi2O3/Bi2WO6, the well-formed heterojunctions (i.e. Bi-Bi2O3 and Bi2O3-Bi2WO6) and the surface plasmon resonance effect of Bi both contribute to an increase in charge carrier concentration, an efficient e(-)/h(+) separation and then an enhanced visible light photocatalytic performance. The molar ratio of Bi, Bi2O3 and Bi2WO6 in composite can be modulated by the dosage of NaBH4, and consequently the amount of each heterojunction (i.e. Bi/Bi2O3 or Bi2O3/Bi2WO6) as well as the intensity of SPR effect could be tuned. The photocatalytic NO removal test under visible light irradiation shows that BWO-0.8 (0.8 denotes the molar ratio of NaBH4 to Bi2WO6) presents a maximum NO removal efficiency of 55.4%, much higher than that of the pristine amorphous Bi2WO6 (10%). The enhanced activity can be attributed to the balanced SPR effect of Bi metal and the heterojunction effect, making their overall contribution maximized. The pathway study of photocatalytic NO oxidation by in situ FT-IR suggests that NO is converted to nitrates adsorbed over the catalyst surface. The present work could provide a new approach to activate the amorphous semiconductors for efficient visible light photocatalysis.

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摘要: The rising demand for radiation detection materials in many applications has led to extensive research on scintillators(1-3). The ability of a scintillator to absorb high-energy (kiloelectronvolt-scale) X-ray photons and convert the absorbed energy into low-energy visible photons is critical for applications in radiation exposure monitoring, security inspection, X-ray astronomy and medical radiography(4,5). However, conventional scintillators are generally synthesized by crystallization at a high temperature and their radioluminescence is difficult to tune across the visible spectrum. Here we describe experimental investigations of a series of all-inorganic perovskite nanocrystals comprising caesium and lead atoms and their response to X-ray irradiation. These nanocrystal scintillators exhibit strong X-ray absorption and intense radioluminescence at visible wavelengths. Unlike bulk inorganic scintillators, these perovskite nanomaterials are solution-processable at a relatively low temperature and can generate X-ray-induced emissions that are easily tunable across the visible spectrum by tailoring the anionic component of colloidal precursors during their synthesis. These features allow the fabrication of flexible and highly sensitive X-ray detectors with a detection limit of 13 nanograys per second, which is about 400 times lower than typical medical imaging doses. We show that these colour-tunable perovskite nanocrystal scintillators can provide a convenient visualization tool for X-ray radiography, as the associated image can be directly recorded by standard digital cameras. We also demonstrate their direct integration with commercial flat-panel imagers and their utility in examining electronic circuit boards under low-dose X-ray illumination.

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作者: Liang, X (Liang, Xun); Liu, XP (Liu, Xiaoping); Li, X (Li, Xia); Chen, YM (Chen, Yimin); Tian, H (Tian, He); Yao, Y (Yao, Yao)

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摘要: Urban growth boundaries (UGBs) have been commonly regarded as a useful tool for controlling urban sprawl. There is a need to create models that can establish plausible UGBs for fast growing regions. Previous methods have merely focused on establishing a single UGB scenario over different time intervals, but rarely considered the influences of macro policy (e.g., future urban demand) and spatial policy (e.g., master plan) for regional planning. However, the spatial patterns of urban expansion are significantly affected by regional planning. In this paper, a CA-based method called the future land use simulation (FLUS) is applied to the delineation of UGBs. We argue that the delineation needs to integrate the top-down approach with CA for projecting complex land use changes under designed scenarios. The system dynamics model (SD) and cellular automaton model (CA) were interactively coupled in the FLUS model during the projection period. The top-down SD is used to project scenarios that relate to macro policy and socioeconomic status, and the bottom-up CA accounts for urban growth simulations under the influence of different driving factors and spatial planning policies. A morphological technology based on erosion and dilation is further proposed to generate the UGBs from the FLUS model's simulated urban forms. The proposed UGB-FLUS model was applied to the establishment of UGBs in the Pearl River Delta region (PRD) from 2020 to 2050. The results demonstrate that the method can support urban planning by generating feasible patterns for UGBs under different planning scenarios.

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摘要: Energy crisis and carbon emission have become two seriously concerned issues universally. As a feasible solution, Energy Internet (EI) has aroused global concern once proposed. EI is a new power generation developing a vision of evolution of smart grids into the Internet. The communication infrastructure is an essential component to the implementation of EI. A scalable and permanent communication infrastructure is crucial in both construction and operation of EI. In this paper, we present an introduction and the motivation to the evolution from smart grid to EI. We also introduce a representative EI architecture, i.e., the future renewable electric energy delivery and management system. Four critical EI features are emphasized. Then, we summarize the essential requirements that EI systems have to meet. With several key supporting technologies, EI shall realize the optimal utilization of highly scalable and distributed green energy resources, so that the situation of severe energy source crisis and carbon emission can be efficiently relieved. Since an EI system might have extensively distributed consumers and devices, the guarantee of its reliability and security is extremely significant. The further specific exploration for challenges, including reliability and security, will be stated in this paper.

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标题: Road Extraction from High-Resolution Remote Sensing Imagery Using Deep Learning

作者: Xu, YY (Xu, Yongyang); Xie, Z (Xie, Zhong); Feng, YX (Feng, Yaxing); Chen, ZL (Chen, Zhanlong)

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摘要: The road network plays an important role in the modern traffic system; as development occurs, the road structure changes frequently. Owing to the advancements in the field of high-resolution remote sensing, and the success of semantic segmentation success using deep learning in computer version, extracting the road network from high-resolution remote sensing imagery is becoming increasingly popular, and has become a new tool to update the geospatial database. Considering that the training dataset of the deep convolutional neural network will be clipped to a fixed size, which lead to the roads run through each sample, and that different kinds of road types have different widths, this work provides a segmentation model that was designed based on densely connected convolutional networks (DenseNet) and introduces the local and global attention units. The aim of this work is to propose a novel road extraction method that can efficiently extract the road network from remote sensing imagery with local and global information. A dataset from Google Earth was used to validate the method, and experiments showed that the proposed deep convolutional neural network can extract the road network accurately and effectively. This method also achieves a harmonic mean of precision and recall higher than other machine learning and deep learning methods.

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作者关键词: road network extraction; deep learning; pyramid attention; global attention; high resolution

KeyWords Plus: CONVOLUTIONAL NEURAL-NETWORKS; CENTERLINE EXTRACTION; RECOGNITION

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标题: One-step synthesis of nanostructured g-C3N4/TiO2 composite for highly enhanced visible-light photocatalytic H-2 evolution

作者: Tan, YG (Tan, Yigen); Shu, Z (Shu, Zhu); Zhou, J (Zhou, Jun); Li, TT (Li, Tiantian); Wang, WB (Wang, Wenbin); Zhao, ZL (Zhao, Zhengliang)

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摘要: Improving the photocatalytic property of g-C3N4 by combined strategies has attracted increasing attention recently. In this work, we realized the structure nanosizing of g-C3N4 and its synchronous compounding with TiO2 nanoparticles in one step, using a facile melamine-involved vapor deposition method coupled with a simple and easy setup. Nanostructured g-C3N4/TiO2 heterojunction was well-established and the resultant nanocomposite demonstrated an excellent visible-light photocatalytic H-2 evolution performance 10.8 times higher than that of bulk g-C3N4. The structure nanosizing coupled with the heterojunction construction contributed together to the improvement of photoinduced electron-hole separation and final photocatalytic efficiency. The proposed simple method and setup have the potential to be used for preparing other g-C3N4-based nanocomposites with advanced photocatalytic properties.

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文献类型: Article

作者关键词: g-C3N4; TiO2; nanocomposite; photocatalysis; hydrogen evolution

KeyWords Plus: GRAPHITIC CARBON NITRIDE; IN-SITU SYNTHESIS; TIO2 NANOTUBE ARRAYS; EFFICIENT PHOTOCATALYST; POLLUTANTS DEGRADATION; HYBRID PHOTOCATALYSTS; HYDROGEN-PRODUCTION; FACILE SYNTHESIS; Z-SCHEME; HETEROJUNCTION

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标题: Transition metal catalyzed sulfite auto-oxidation systems for oxidative decontamination in waters: A state-of-the-art minireview

作者: Zhou, DN (Zhou, Danna); Chen, L (Chen, Long); Li, JJ (Li, Jinjun); Wu, F (Wu, Feng)

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摘要: Sulfate radical (SO4 (.-)) is believed to be one of the most highly reactive oxidants, as superior as hydroxyl radical (HO.), for various organic/inorganic contaminants removal in the field of pollution control chemistry. In the recent decade, sulfate radical-based advanced oxidation processes (SR-AOPs) have been developed quickly primarily due to the selective oxidation and high oxidative potential and therefore hold great promises. Although peroxydisulfate (PDS) and peroxymonosulfate (PMS) have been extensively utilized in various SR-AOPs, new attempts have been made to replace PDS/PMS with sulfite for the purpose of SO4.- generation at lower cost. Indeed, some significant progresses have been achieved in driving SO4.- generation from transient metal catalyzed sulfite auto-oxidation systems to oxidize contaminants. The background, basic mechanisms, and application of the transition metal catalyzed sulfite auto-oxidation systems in contaminants detoxification and microorganism inactivation are reviewed in this work. Meanwhile, we hereby also want to point out several important unresolved issues for future investigation. (1) How to realize quick reactions at near neutral pH? (2) How to achieve high rate of mineralization as equally as or at least close to the apparent complete elimination of substrates? (3) What are the relative contributions of various oxysulfur radicals to the transformation of contaminants. (4) Is it possible to control the extent of substrates oxidation so as to get target transformed products with desired properties? If so, SR-AOPs can be upgraded as product-oriented AOPs (PO-AOPs). This state-of-art minireview aims to discuss abovementioned issues and presents some recent progresses in this field.

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作者关键词: Sulfate radical; Sulfite anion; Advanced oxidation processes (AOPs); Transition metal catalysts; Oxysulfur radical; Oxidative transformation

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标题: SuperPCA: A Superpixelwise PCA Approach for Unsupervised Feature Extraction of Hyperspectral Imagery

作者: Jiang, JJ (Jiang, Junjun); Ma, JY (Ma, Jiayi); Chen, C (Chen, Chen); Wang, ZY (Wang, Zhongyuan); Cai, ZH (Cai, Zhihua); Wang, LZ (Wang, Lizhe)

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摘要: As an unsupervised dimensionality reduction method, the principal component analysis (PCA) has been widely considered as an efficient and effective preprocessing step for hyperspectral image (HSI) processing and analysis tasks. It takes each band as a whole and globally extracts the most representative hands. However, different homogeneous regions correspond to different objects, whose spectral features are diverse. Therefore, it is inappropriate to carry out dimensionality reduction through a unified projection for an entire HSI. In this paper, a simple but very effective superpixelwise PCA (SuperPCA) approach is proposed to learn the intrinsic low-dimensional features of HSIs. In contrast to classical PCA models, the SuperPCA has four main properties: 1) unlike the traditional PCA method based on a whole image, the SuperPCA takes into account the diversity in different homogeneous regions, that is, different regions should have different projections; 2) most of the conventional feature extraction models cannot directly use the spatial information of HSIs, while the SuperPCA is able to incorporate the spatial context information into the unsupervised dimensionality reduction by superpixel segmentation; 3) since the regions obtained by superpixel segmentation have homogeneity, the SuperPCA can extract potential low-dimensional features even under noise; and 4) although the SuperPCA is an unsupervised method, it can achieve a competitive performance when compared with supervised approaches. The resulting features are discriminative, compact, and noise-resistant, leading to an improved HSI classification performance. Experiments on three public data sets demonstrate that the SuperPCA model significantly outperforms the conventional PCA-based dimensionality reduction baselines for HSI classification, and some state-of-the-art feature extraction approaches. The MATLAB source code is available at https://github.com/junjun-jiang/SuperPCA.

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作者关键词: Feature extraction; hyperspectral image (HSI) classification; principal component analysis (PCA); superpixel segmentation; unsupervised dimensionality reduction

KeyWords Plus: DIMENSIONALITY REDUCTION; SPARSE REPRESENTATION; DISCRIMINANT-ANALYSIS; COMPONENT ANALYSIS; CLASSIFICATION; FUSION

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标题: Emerging Pt-based electrocatalysts with highly open nanoarchitectures for boosting oxygen reduction reaction

作者: Li, CL (Li, Cuiling); Tan, HB (Tan, Haibo); Lin, JJ (Lin, Jianjian); Luo, XL (Luo, Xiliang); Wang, SP (Wang, Shengping); You, J (You, Jungmok); Kang, YH (Kang, Yong-Hook); Bando, Y (Bando, Yoshio); Yamauchi, Y (Yamauchi, Yusuke); Kim, J (Kim, Jeonghun)

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摘要: Developing highly efficient and stable platinum (Pt)-based electrocatalysts for oxygen reduction reaction (ORR) is the most essential step toward the commercialization of fuel cells. Highly accessible reactive surfaces play a key role in boosting ORR for superior fuel cell performance due to the adequate exposure of the active surfaces and the feasible mass transport. Herein, we begin with a brief introduction to the design principles for an effective ORR electrocatalyst, which could plausibly possess high activity and durability at the same time. Corresponding with the requirements, the recent progress of rational design based on nanoarchitecture, synthesis, and electrochemical performances of Pt -based electrocatalysts with open construction is reviewed and explained accordingly. (C) 2018 Elsevier Ltd. All rights reserved.

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作者关键词: Pt-based electrocatalysts; Nanoarchitecture; Oxygen reduction reaction (ORR); Metal nanomaterials; Fuel cell; Open construction

KeyWords Plus: HIGH-INDEX FACETS; MESOPOROUS PLATINUM NANOSPHERES; SIZE-CONTROLLED SYNTHESIS; ELECTROCHEMICAL SYNTHESIS; MEDIATED SYNTHESIS; ENHANCED ACTIVITY; FILMS; CATALYSTS; NANOCRYSTALS; NANOWIRES

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标题: Characterizations of full-scale pore size distribution, porosity and permeability of coals: A novel methodology by nuclear magnetic resonance and fractal analysis theory

作者: Zheng, SJ (Zheng, Sijian); Yao, YB (Yao, Yanbin); Liu, DM (Liu, Dameng); Cai, YD (Cai, Yidong); Liu, Y (Liu, Yong)

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摘要: Nuclear magnetic resonance (NMR) has been widely used to evaluate the pore size distribution (PSD) properties of coals. However, the NMR signal itself only provides a relative distribution of pore size. To calculate an absolute pore size distribution from the NMR data, the T-2 cutoff value needs to be known. Meanwhile, the T-2 cutoff value is an indicator to divide the irreducible fluid and movable fluid in porous rock and a key factor for permeability prediction. Conventionally, the T-2 cutoff value is obtained by centrifugal experiments, the process of which is complicated and time consuming, and some T-2 cutoff value prediction models are not suitable for coals with complex pore structures. Hence, a new method is needed for T-2 cutoff value prediction. In this study, we performed scanning electron microscopy (SEM), low-temperature nitrogen adsorption/desorption (LTNA) and NMR experiments on 12 coal samples. The results of SEM and LTNA reveal the complex pore structures of the coals. According to the results from centrifugal experiments, the T-2 cutoff value is in the range from 0.5-2.8 ms for subbituminous coals, whereas it is 15-32 ms for anthracite coals. We present a fractal theory based method for T-2 cutoff value prediction. Using the estimated T-2 cutoff values, we calculated the movable porosities, PSD and permeability for the selected coals. The results show that the proposed permeability model provides significantly better permeability estimation than classic (Coates and SDR) models. These methods are applicable not only for coals, but also for other unconventional gas reservoir rocks such as gas shales.

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摘要: Rising oceanic and atmospheric oxygen levels through time have been crucial to enhanced habitability of surface Earth environments. Few redox proxies can track secular variations in dissolved oxygen concentrations around threshold levels for metazoan survival in the upper ocean. We present an extensive compilation of iodine-to-calcium ratios (I/Ca) in marine carbonates. Our record supports a major rise in the partial pressure of oxygen in the atmosphere at similar to 400 million years (Ma) ago and reveals a step change in the oxygenation of the upper ocean to relatively sustainable near-modern conditions at similar to 200 Ma ago. An Earth system model demonstrates that a shift in organic matter remineralization to greater depths, which may have been due to increasing size and biomineralization of eukaryotic plankton, likely drove the I/Ca signals at similar to 200 Ma ago.

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作者: Deng, J (Deng, Jun); Wang, CM (Wang, Changming); Bagas, L (Bagas, Leon); Santosh, M (Santosh, M.); Yao, EY (Yao, Enya)

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摘要: The south-eastern part of the North China Craton (NCC), the major historical source of gold supply to the former Emperors of China, continues to be a potential target for gold exploration. With a view to gain insights on the crustal architecture and gold metallogeny of this region, this contribution combines geological and Nd-Hf-isotopic data from magmatic rocks associated with the ore mineralisation. We integrate Nd-Hf isotopic data from published works as a tool to present isotopic maps. These maps highlight the location of major tectonic structures, and their relationship with the distribution of mineral deposits in the south-eastern NCC. The porphyry and porphyry-skam Cu(-Au-Mo) deposits in the Luxi area in eastern NCC are associated with magmatic rocks and are located in zones with variable epsilon Nd-epsilon Hf values and T-DM(c)-T-DM(2) ages representing dominant Paleoproterozoic to Mesoproterozoic and reworked crustal components with minor mantle material. In contrast, the Jiaodong type Au and porphyry-skam Mo(-W-Cu) deposits are associated with magmatic rocks emplaced in domains with low-epsilon Nd-epsilon Hf values and older T-DM(c)-T-DM(2) ages characterised by dominantly Archean-Paleoproterozoic reworked crustal components in the Jiaobei Terrane and the Sulu Orogen. Our study thus demarcates distinct crustal provinces and source components in generating some of the world-class gold deposits.

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作者: Groves, DI (Groves, David I.); Santosh, M (Santosh, M.); Goldfarb, RJ (Goldfarb, Richard J.); Zhang, L (Zhang, Liang)

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摘要: With very few exceptions, orogenic gold deposits formed in subduction-related tectonic settings in accretionary to collisional orogenic belts from Archean to Tertiary times. Their genesis, including metal and fluid source, fluid pathways, depositional mechanisms, and timing relative to regional structural and metamorphic events, continues to be controversial. However, there is now general agreement that these deposits formed from metamorphic fluids, either from metamorphism of intra-basinal rock sequences or de-volatilization of a subducted sediment wedge, during a change from a compressional to transpressional, less commonly transtensional, stress regime, prior to orogenic collapse. In the case of Archean and Paleoproterozoic deposits, the formation of orogenic gold deposits was one of the last events prior to cratonization. The late timing of orogenic gold deposits within the structural evolution of the host orogen implies that any earlier structures may be mineralized and that the current structural geometry of the gold deposits is equivalent to that at the time of their formation provided that there has been no significant post-gold orogenic overprint. Within the host volcano-sedimentary sequences at the province scale, world-class orogenic gold deposits are most commonly located in second-order structures adjacent to crustal scale faults and shear zones, representing the first-order ore-forming fluid pathways, and whose deep lithospheric connection is marked by lamprophyre intrusions which, however, have no direct genetic association with gold deposition. More specifically, the gold deposits are located adjacent to similar to 10 degrees-25 degrees district-scale jogs in these crustal-scale faults. These jogs are commonly the site of arrays of similar to 70 degrees cross faults that accommodate the bending of the more rigid components, for example volcanic rocks and intrusive sills, of the host belts. Rotation of blocks between these accommodation faults causes failure of more competent units and/or reactivation and dilation of pre-existing structures, leading to deposit-scale focussing of ore-fluid and gold deposition. Anticlinal or antiformal fold hinges, particularly those of 'locked-up' folds with similar to 30 degrees apical angles and overturned back limbs, represent sites of brittle-ductile rock failure and provide one of the more robust parameters for location of orogenic gold deposits.

In orogenic belts with abundant pre-gold granitic intrusions, particularly Precambrian granitegreenstone terranes, the boundaries between the rigid granitic bodies and more ductile greenstone sequences are commonly sites of heterogeneous stress and inhomogeneous strain. Thus, contacts between granitic intrusions and volcano-sedimentary sequences are common sites of ore-fluid infiltration and gold deposition. For orogenic gold deposits at deeper crustal levels, ore-forming fluids are commonly focused along strain gradients between more compressional zones where volcano-sedimentary sequences are thinned and relatively more extensional zones where they are thickened. World-class orogenic gold deposits are commonly located in the deformed volcano-sedimentary sequences in such strain gradients adjacent to triple-point junctions defined by the granitic intrusions, or along the zones of assembly of micro-blocks on a regional scale. These repetitive province to district-scale geometrical patterns of structures within the orogenic belts are clearly critical parameters in geology-based exploration targeting for orogenic gold deposits. (C) 2018, China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V.

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摘要: The North China Craton (NCC) is one of the important Precambrian nuclei of the globe as well as an integral component of the Paleoproterozoic supercontinent Columba. The NCC is considered in popular models as an assembly of two major crustal blocks, the Eastern and Western Blocks, which were sutured along the Trans-North China Orogen (TNCO), which represents a major Paleoproterozoic collisional orogen. The central segment of the TNCO preserves important keys to unravel the tectonic history of amalgamation and cratonization of the NCC. Here we present an overview on the lithology, geochemistry, geochronology, Lu-Hf isotopes and metamorphic history of the Neoarchean to Paleoproterozoic rocks in the major basement terranes from the central segment of the TNCO. The available data allow us to re-construct the major Precambrian events from the heart of the NCC as follows. (1) 2.58-2.48 Ga: amalgamation of three microblocks (Ordos, Qianhuai and Xuchang) along the Wutai granite-greenstone belt and its branch at the Zanhuang area, together with the convergence of major micro blocks along other -2.5 Ga granite-greenstone belts leading to the initial cratonization of the NCC. (2) 2.50-2.45 Ga: post-collisional extension as represented by undeformed mafic dykes and granitoid dykes or plutons, resulting in the opening of an oceanic basin along the Hengshan and Huai'an-Xuanhua Complexes. (3) 2.45-2.12 Ga: subduction in the Hengshan, Hual'an-Xuanhua and Luliang Complexes, and simultaneous rifting in the Fuping, Wutai and Zanhuang Complexes. (4) 2.12-1.98 Ga: opening of oceanic basins in the Wutai and Fuping areas followed by double subduction of the oceanic lithosphere and arc magmatism in the Fuping, Wutai and Ltiliang Complexes, with coeval rifting in the northern part as represented by the Hengshan and Huai'anXuanhua Complexes and the southern side as represented by the Zanhuang Complex. (5) 1.96-1.80 Ga: the assembly of the separated terranes (or complexes) driven by the amalgamation of the Western and Eastern Blocks. The collisional event may have occurred at 1.96-1.90 Ga, and the 1.88-1.80 Ga metamorphic ages might represent the retrograde cooling during exhumation. (6) Termination of the collisional event represented by post-collisional intrusions of granitoids, charnockites and pegmatites until ca. 1.74 Ga. Thus the central segment of the TNCO records a prolonged Wilson cycle following the initial cratonization of the NCC during Neoarchean, and involved multiple rift-subduction and collisional processes in the Paleoproterozoic resulting in the unified NCC and its incorporation into the supercontinent Columbia.

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作者关键词: North China Craton; Trans-North China Orogen; Terrane assembly; Archean-Paleoproterozoic; Wilson cycle

KeyWords Plus: ZIRCON U-PB; HIGH-PRESSURE GRANULITES; A-TYPE GRANITE; HEBEI PROVINCE CONSTRAINTS; WUTAI-FUPING COMPLEXES; BANDED IRON-FORMATION; LOWER CRUSTAL SECTION; LU-HF ISOTOPE; T-T EVOLUTION; TECTONIC EVOLUTION

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标题: Experimental study on spontaneous imbibition of recycled fracturing flow-back fluid to enhance oil recovery in low permeability sandstone reservoirs

作者: You, Q (You, Qing); Wang, H (Wang, Huan); Zhang, Y (Zhang, Yan); Liu, YF (Liu, Yifei); Fang, JC (Fang, Jichao); Dai, CL (Dai, Caili)

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摘要: In light of the high treatment costs for massive amounts of fracturing flow-back fluid and its harmfulness to the environment, a novel method of recycled fracturing flow-back fluid (RFFF) to enhance oil recovery by spontaneous imbibition is proposed in this study; this method does not allow the flow-back fluid back to the ground, thereby preventing negative impacts. The wettability alteration and interfacial tension (IFT) can effectively strengthen the spontaneous imbibition to enhance oil recovery in low-permeability sandstone reservoirs. This study combines the effects of wettability alteration and IFT with the use of the RFFF, which is composed of viscoelastic surfactants, on the spontaneous imbibition in low-permeability outcrop cores. Contact angle (CA) experiments, IFT experiments, and spontaneous imbibition experiments are conducted. The CA and IFT experimental results showed that the RFFF solutions changed the wettability of the core surface from oil-wet to waterwet and easily reduced the IFT between the crude oil and the RFFF solution to 10(-3)-10(-2) mN/m, which improved the oil recovery by changing the capillary forces. The spontaneous imbibition results showed that the RFFF solutions at concentrations of 0.03 - 0.10 wt% resulted in a higher imbibition recovery due to the synergistic effect of the wettability alteration and the IFT, which was attributed to the wedge film structure and the spreading force. It can be concluded that the use of the RFFF has the potential to further enhance oil recovery after fracturing the formation in low-permeability reservoirs without letting the fluid flow back to the ground. The proposed method is multi-functional and does not only improve the oil recovery by integrating fracturing and displacement methods but also reduces the costs of reservoir development and protects the environment.

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作者: Wei, ZC (Wei, Zhouchao); Pham, VT (Viet-Thanh Pham); Khalaf, AJM (Khalaf, Abdul Jalil M.); Kengne, J (Kengne, Jacques); Jafari, S (Jafari, Sajad)

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摘要: In this paper, by modifying a known two-dimensional oscillator, we obtain an interesting new oscillator with coexisting limit cycles and point attractors. Then by changing this new system to its forced version and choosing a proper set of parameters, we introduce a chaotic system with some very interesting features. In this system, not only can we see the coexistence of different types of attractors, but also a fascinating phenomenon: some initial conditions can escape from the gravity of nearby attractors and travel far away before being trapped in an attractor beyond the usual access.

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标题: Formation of Archean (3600-2500 Ma) continental crust in the Dharwar Craton, southern India

作者: Jayananda, M (Jayananda, M.); Santosh, M (Santosh, M.); Aadhiseshan, KR (Aadhiseshan, K. R.)

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摘要: The generation, preservation and destruction of continental crust on Earth is of wide interest in understanding the formation of continents, cratons and supercontinents as well as related mineral deposits. In this contribution, we integrate the available field, petrographic, geochronologic, elemental Nd-Hf-Pb isotope data for greenstones, TTG gneisses, sanukitoids and anatectic granites from the Dharwar Craton (southern India). This review allows us to evaluate the accretionary processes of juvenile crust, mechanisms of continental growth, and secular evolution of geodyrtamic processes through the 3600-2500 Ma window, hence providing important insights into building of continents in the Early Earth. The Dharwar Craton formed by assembly of micro-blocks with independent thermal records and accretionary histories. The craton can be divided into three crustal blocks (western, central and eastern) separated by major shear zones. The western block contains some of the oldest basement rocks with two generations of volcano-sedimentary greenstone sequences and discrete potassic plutons whereas the central block consist of older migmatitic TTGs, abundant younger transitional TTGs, remnants of ancient high grade supracrustal rocks, linear volcanic-dominated greenstone belts, voluminous calc-alkaline granitoids of sanukitoid affinity and anatectic granites. In contrast, the eastern block comprises younger transitional TTGs, abundant diatexites, thin volcanic-sedimentary greenstone belts and calc-alkaline plutons. Published geochronologic data show five major periods of felsic crust formation at ca. 3450-3300 Ma, 3230-3150 Ma, 3000-2960 Ma, 2700-2600 Ma, and 2560-2520 Ma which are sub-contemporaneous with the episodes of greenstone volcanism. U-Pb ages of inherited zircons in TTGs, as well as detrital zircons together with Nd-Pb-Hf isotope data, reveal continental records of 3800-3600 Ma. The U-Pb zircon data suggest at least four major reworking events during ca. 3200 Ma, 3000 Ma, 2620-2600 Ma, and 2530-2500 Ma corresponding to lower crustal melting and spatially linked high grade metamorphic events. The TTGs are sub-divided into the older (3450-3000 Ma) TTGs and the younger (2700-2600 Ma) transitional TTGs. The older TTGs can be further sub-divided into low-Al and high-Al groups. Elemental and isotopic data suggest that the low-Al type formed by melting of oceanic island arc crust within plagioclase stability field. In contrast, the elemental and isotopic features for the high-Al group suggest derivation of their magmatic precursor by melting of oceanic arc crust at deeper levels (55-65 km)with variable garnet and ilmenite in residue. The transitional TTGs likely formed by melting of composite sources involving both enriched oceanic arc crust and sub-arc mantle with minor contamination of ancient crustal components. The geochemical and isotopic compositions of granitoids with sanukitoid affinity suggest derivation from enriched mantle reservoirs. Finally, anatectic granites were produced by reworking of crustal sources with different histories. In the light of the data reviewed in this contribution, we propose the following scenario for the tectonic evolution of the Dharwar Craton. During 3450-3000 Ma, TTGs sources (oceanic arc crust) formed by melting of down going slabs and subsequent melting of such newly formed crust at different depths resulted in TTG magmas. On the contrary, by 2700 Ma the depth of slab melting increased.

Melting of slab at greater depth alongside the detritus results in enriched melts partly modified the overlying mantle wedge. Subsequent melting of such newly formed enriched oceanic arc crust and surrounding arc-mantle generated the magmatic precursor to transitional TTGs. Finally at ca. 2600-2560 Ma, eventual breakoff of down going slab caused mantle upwelling which induced low degree (10-15%) melting of overlying enriched mantle at different depths, thereby, generating the sanukitoid magmas which upon emplacement into the crust caused high temperature metamorphism, reworking and final cratonization.

The crustal accretion patterns in the Dharwar Craton share similarities with those in other Archean cratons such as the Bundelkhand Craton in Central India, Pilbara-Yilgarn Craton in Western Australia, Southern Africa (Swaziland and Limpopo belt), North China Craton, Tanzania Craton, Antongil Craton, NE Madagascar.

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标题: Health information privacy concerns, antecedents, and information disclosure intention in online health communities

作者: Zhang, X (Zhang, Xing); Liu, S (Liu, Shan); Chen, X (Chen, Xing); Wang, L (Wang, Lin); Gao, BJ (Gao, Baojun); Zhu, Q (Zhu, Qing)

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摘要: This study explores the antecedents and consequences of health information privacy concerns in online health communities by integrating the dual calculus and protection motivation theories. On the basis of survey data from 337 users, health information privacy concerns, together with informational and emotional support, significantly influence personal health information (PHI) disclosure intention. Privacy concerns are negatively influenced by two coping appraisals (i.e., response efficacy and self-efficacy) and positively affected by two threat appraisals (i.e., perceived vulnerability and perceived severity). The perceived health status differentially moderates the effects of privacy concerns and informational support on the PHI disclosure intention.

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摘要: Although comprehensive progress has been made in the area of coordination polymer (CP)/metal-organic framework (MOF)-based proton-conducting materials over the past decade, searching for a CP/MOF with stable, intrinsic, high anhydrous proton conductivity that can be directly used as a practical electrolyte in an intermediate-temperature proton-exchange membrane fuel cell assembly for durable power generation remains a substantial challenge. Here, we introduce a new protonconducting CP, (NH4)(3)[Zr(H2/3PO4)(3)] (ZrP), which consists of one-dimensional zirconium phosphate anionic chains and fully ordered charge-balancing NH4+ cations. X-ray crystallography, neutron powder diffraction, and variable-temperature solid-state NMR spectroscopy suggest that protons are disordered within an inherent hydrogen-bonded infinite chain of acid-base pairs (N-H...O-P), leading to a stable anhydrous proton conductivity of 1.45 X 10(-3) S.cm(-1) at 180 degrees C, one of the highest values among reported intermediate-temperature proton-conducting materials. First-principles and quantum molecular dynamics simulations were used to directly visualize the unique proton transport pathway involving very efficient proton exchange between NH4+ and phosphate pairs, which is distinct from the common guest encapsulation/dehydration/superprotonic transition mechanisms. ZrP as the electrolyte was further assembled into a H-2/O-2 fuel cell, which showed a record-high electrical power density of 12 mW-cm(-2) at 180 degrees C among reported cells assembled from crystalline solid electrolytes, as well as a direct methanol fuel cell for the first time to demonstrate real applications. These cells were tested for over 15 h without notable power loss.

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KeyWords Plus: METAL-ORGANIC FRAMEWORKS; FUEL-CELL; HYDROGEN-BOND; DEGREES-C; CRYSTALLINE; TEMPERATURE; STATE; SIMULATIONS; CONDUCTORS; NETWORK

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输出日期: 2022-01-19

标题: Carbon Quantum Dot Implanted Graphite Carbon Nitride Nanotubes: Excellent Charge Separation and Enhanced Photocatalytic Hydrogen Evolution

作者: Wang, Y (Wang, Yang); Liu, XQ (Liu, Xueqin); Liu, J (Liu, Jia); Han, B (Han, Bo); Hu, XQ (Hu, Xiaoqin); Yang, F (Yang, Fan); Xu, ZW (Xu, Zuwei); Li, YC (Li, Yinchang); Jia, SR (Jia, Songru); Li, Z (Li, Zhen); Zhao, YL (Zhao, Yanli)

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摘要: Graphite carbon nitride (g-C3N4) is a promising candidate for photocatalytic hydrogen production, but only shows moderate activity owing to sluggish photocarrier transfer and insufficient light absorption. Herein, carbon quantum dots (CQDs) implanted in the surface plane of g-C3N4 nanotubes were synthesized by thermal polymerization of freeze-dried urea and CQDs precursor. The CQD-implanted g-C3N4 nanotubes (CCTs) could simultaneously facilitate photoelectron transport and suppress charge recombination through their specially coupled heterogeneous interface. The electronic structure and morphology were optimized in the CCTs, contributing to greater visible light absorption and a weakened barrier of the photocarrier transfer. As a result, the CCTs exhibited efficient photocatalytic performance under light irradiation with a high H-2 production rate of 3538.3 mu mol g(-1) h(-1) and a notable quantum yield of 10.94% at 420 nm.

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文献类型: Article

作者关键词: carbon quantum dots; graphite carbon nitride; hydrogen production; photocatalysis; nanotubes

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输出日期: 2022-01-19

标题: Flexible Quasi-Solid-State Sodium-Ion Capacitors Developed Using 2D Metal-Organic-Framework Array as Reactor

作者: Xu, DM (Xu, Dongming); Chao, DL (Chao, Dongliang); Wang, HW (Wang, Huanwen); Gong, YS (Gong, Yansheng); Wang, R (Wang, Rui); He, BB (He, Beibei); Hu, XL (Hu, Xianluo); Fan, HJ (Fan, Hong Jin)

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摘要: Achieving high-performance Na-ion capacitors (NICs) has the particular challenge of matching both capacity and kinetics between the anode and cathode. Here a high-power NIC full device constructed from 2D metal-organic framework (MOFs) array is reported as the reactive template. The MOF array is converted to N-doped mesoporous carbon nanosheets (mp-CNSs), which are then uniformly encapsulated with VO2 and Na3V2(PO4)(3) (NVP) nanoparticles as the electroactive materials. By this method, the high-power performance of the battery materials is enabled to be enhanced significantly. It is discovered that such hybrid NVP@mp-CNSs array can render ultrahigh rate capability (up to 200 C, equivalent to discharge within 18 s) and superior cycle performance, which outperforms all NVP-based Na-ion battery cathodes reported so far. A quasi-solid-state flexible NIC based on the NVP@mp-CNSs cathode and the VO2@mp-CNSs anode is further assembled. This hybrid NIC device delivers both high energy density and power density as well as a good cycle stability (78% retention after 2000 cycles at 1 A g(-1)). The results demonstrate the powerfulness of MOF arrays as the reactor for fabricating electrode materials.

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文献类型: Article

作者关键词: asymmetric supercapacitors; hybrid batteries; metal-organic frameworks; Na3V2(PO4)(3); sodium-ion capacitors

KeyWords Plus: ENERGY-STORAGE DEVICES; CARBON-COATED NA3V2(PO4)(3); HIGH-PERFORMANCE; ASYMMETRIC SUPERCAPACITORS; HYBRID CAPACITORS; POWER-DENSITY; ELECTRODES; BATTERIES; NANOSHEETS; LI

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标题: The functionality of prebiotics as immunostimulant: Evidences from trials on terrestrial and aquatic animals

作者: Nawaz, A (Nawaz, Asad); Javaid, AB (Javaid, Allah Bakhsh); Irshad, S (Irshad, Sana); Hoseinifar, SH (Hoseinifar, Seyed Hossein); Xiong, HG (Xiong, Hanguo)

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摘要: The gut immune system is, the main option for maintaining host's health, affected by numerous factors comprising dietary constituents and commensal bacteria. These dietary components that affect the intestinal immunity and considered as an alternative of antibiotics are called immunosaccharides. Fructooligosaccharide (FOS), Galactooligosaccharide (GOS), inulin, dietary carbohydrates, and xylooligosaccharide (XOS) are among the most studied prebiotics in human as well as in aquaculture. Although prebiotics and probiotics have revealed potential as treatment for numerous illnesses in both human and fish, a comprehensive understanding of the molecular mechanism behind direct and indirect effect on the intestinal immune response will help more and perhaps extra effective therapy intended for ailments. This review covers the most newly deep-rooted scientific outcomes about the direct and indirect mechanism through which these dietetic strategies can affect intestinal immunity of terrestrial and aquatic animals. Prebiotics exert an influence on gut immune system via the increase in lysozyme and phagocytic activity, macrophage activation and stimulation of monocyte-derived dendritic cells. Furthermore, these functional molecules also enhance epithelial barrier function, beneficial gut microbial population, and production of intermediate metabolites for example short chain fatty acids (SCFAs) that assist in balancing the immune system. Moreover, emphasis will be sited on the relationship among food/feed, the microbiota, and the gut immune system. In conclusion, further studies are nonetheless essential to confirm the direct effect of prebiotics on immune response.

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语言: English

文献类型: Review

作者关键词: Prebiotics; Probiotics; Immunity; SCFA; Mechanism of action

KeyWords Plus: CHAIN FATTY-ACIDS; INTESTINAL EPITHELIAL-CELLS; AUTOCHTHONOUS GUT BACTERIA; HUMORAL IMMUNE-RESPONSES; GROWTH-PERFORMANCE; GENES EXPRESSION; INNATE IMMUNITY; GALACTO-OLIGOSACCHARIDES; PEDIOCOCCUS-ACIDILACTICI; DISEASE RESISTANCE

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标题: Progress and performance evaluation of BeiDou global navigation satellite system: Data analysis based on BDS-3 demonstration system

作者: Yang, YX (Yang, Yuanxi); Xu, YY (Xu, Yangyin); Li, JL (Li, Jinlong); Yang, C (Yang, Cheng)

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摘要: The first two Medium Earth Orbit (MEO) satellites of the third generation of BeiDou satellite navigation System (BDS-3) were successfully launched on November 5, 2017. This historical launch starts the new era of the global navigation satellite system of BeiDou. Before the first two satellites of BDS-3, a demonstration system for BDS-3 with five satellites, including two Inclined Geosynchronous Orbit satellites (IGSO) and three MEO satellites, was established between 2015 and 2016 for testing the new payloads, new designed signals and new techniques. In the demonstration system, the new S frequency signal and satellite hydrogen clock as well as inter-satellite link (ISL) based on Ka-band signals with time-division multiple addresses (TDMA) were tested. This paper mainly analyzes the performances of the demonstration system, including the signalto- noise ratios, pseudorange errors and the multipath errors of the civilian signals of BDS-3. The qualities of signals in space, time synchronization and timing precision were tested as well. Most of the performances were compared with those of the regional BeiDou satellite navigation system (BDS-2). At last, the performances of positioning, navigation and timing (PNT) of the future BeiDou global system (BDS-3) were evaluated based on the signal quality of the present demonstration satellite system.

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作者关键词: BeiDou-3; Demonstration satellite; Signal; Timing; Signal-to-noise ratios

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作者: Zuza, AV (Zuza, Andrew, V); Wu, C (Wu, Chen); Reith, RC (Reith, Robin C.); Yin, A (Yin, An); Li, JH (Li, Jianhua); Zhang, JY (Zhang, Jinyu); Zhang, YX (Zhang, Yuxiu); Wu, L (Wu, Long); Liu, WC (Liu, Wencan)

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摘要: The Qilian Shan, located along the northeastern margin of the Tibetan Plateau, has experienced multiple episodes of tectonic deformation, including Neoproterozoic continental breakup, early Paleozoic subduction and continental collision, Mesozoic extension, and Cenozoic intracontinental orogenesis resulting from the India-Asia collision. In the central Qilian Shan, pre-Mesozoic ophiolite complexes, passive-continental margin sequences, and strongly deformed forearc strata were juxtaposed against arc plutonic/ volcanic rocks and ductilely deformed crystalline rocks during the early Paleozoic Qilian orogen. To better constrain this orogen and the resulting closure of the Neoproterozoic-Ordovician Qilian Ocean, we conducted an integrated investigation involving geologic mapping, U-Th-Pb zircon and monazite geochronology, whole-rock geochemistry, thermobarometry, and synthesis of existing data sets across northern Tibet. The central Qilian Shan experienced two phases of arc magmatism at 960-870 Ma and 475-445 Ma that were each followed by periods of protracted continental collision. Integrating our new data with previously published results, we propose the following tectonic model for the Proterozoic-Paleozoic history of northern Tibet. (1) Early Neoproterozoic subduction accommodated the convergence and collision between the South Tarim-Qaidam and North Tarim-North China continents. (2) Late Neoproterozoic rifting partially separated a peninsular Kunlun-Qaidam continent from the southern margin of the linked Tarim-North China craton and opened the Qilian Ocean as an embayed marginal sea; this separation broadly followed the trace of the earlier Neoproterozoic suture zone. (3) South-dipping subduction along the northern margin of the Kunlun-Qaidam continent initiated in the Cambrian, first developing as the Yushigou supra-subduction zone ophiolite and then transitioning into the continental Qilian arc. (4) South-dipping subduction, arc magmatism, and the convergence between Kunlun-Qaidam and North China continued throughout the Ordovician, with a trench-parallel intra-arc strike-slip fault system that is presently represented by high-grade metamorphic rocks that display a pervasive right-lateral shear sense. (5) Counterclockwise rotation of the peninsular Kunlun-Qaidam continent toward North China led to the closure of the Qilian Ocean, which is consistent with the right-lateral kinematics of intra-arc strike-slip faulting observed in the Qilian Shan and the westward tapering map-view geometry of Silurian fiysch-basin strata. Continental collision at ca. 445-440 Ma led to widespread plutonism across the Qilian Shan and is recorded by recrystallized monazite (ca. 450-420 Ma) observed in this study. Our tectonic model implies the parallel closure of two oceans of different ages along the trace of the Qilian suture zone since ca. 1.0 Ga.

In addition, the Qilian Ocean was neither the Proto- nor Paleo-Tethys (i.e., the earliest ocean separating Gondwana from Laurasia), as previously suggested, but was rather a relatively small embayed sea along the southern margin of the Laurasian continent. We also document >200 km of Cenozoic north-south shortening across the study area. The observed shortening distribution supports supports models of Tibetan Plateau development that involve distributed crustal shortening and southward underthrusting of Eurasia beneath the plateau. This India-Asia convergence-related deformation is focused along the sites of repeated ocean closure. Major Cenozoic left-slip faults parallel these sutures, and preexisting subduction-melange channels may have facilitated Cenozoic shortening and continental underthrusting

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标题: Recent Advances in Layered Ti3C2Tx MXene for Electrochemical Energy Storage

作者: Xiong, DB (Xiong, Dongbin); Li, XF (Li, Xifei); Bai, ZM (Bai, Zhimin); Lu, SG (Lu, Shigang)

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摘要: Ti3C2Tx, a typical representative among the emerging family of 2D layered transition metal carbides and/or nitrides referred to as MXenes, has exhibited multiple advantages including metallic conductivity, a plastic layer structure, small band gaps, and the hydrophilic nature of its functionalized surface. As a result, this 2D material is intensively investigated for application in the energy storage field. The composition, morphology and texture, surface chemistry, and structural configuration of Ti3C2Tx directly influence its electrochemical performance, e.g., the use of a well-designed 2D Ti3C2Tx as a rechargeable battery anode has significantly enhanced battery performance by providing more chemically active interfaces, shortened ion-diffusion lengths, and improved in-plane carrier/charge-transport kinetics. Some recent progresses of Ti3C2Tx MXene are achieved in energy storage. This Review summarizes recent advances in the synthesis and electrochemical energy storage applications of Ti3C2Tx MXene including supercapacitors, lithium-ion batteries, sodium-ion batteries, and lithium-sulfur batteries. The current opportunities and future challenges of Ti3C2Tx MXene are addressed for energy-storage devices. This Review seeks to provide a rational and in-depth understanding of the relation between the electrochemical performance and the nanostructural/chemical composition of Ti3C2Tx, which will promote the further development of 2D MXenes in energy-storage applications.

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标题: Highly Efficient Blue Emission and Superior Thermal Stability of BaAI(12)O(19):Eu2+ Phosphors Based on Highly Symmetric Crystal Structure

作者: Wei, Y (Wei, Yi); Cao, L (Cao, Ling); Lv, LM (Lv, Lemin); Li, GG (Li, Guogang); Hao, JR (Hao, Jiarui); Gao, JS (Gao, Junsong); Su, CC (Su, Chaochin); Lin, CC (Lin, Chun Che); Jang, HS (Jang, Ho Seong); Dang, PP (Dang, Peipei); Lin, J (Lin, Jun)

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摘要: Highly efficient phosphor materials with superior thermal stability are indispensable for phosphor-converted white light-emitting diodes (pc-WLEDs) solid state lighting. In order to obtain a high quality warm white light, near-ultraviolet (n-UV) chips combined with trichromatic phosphors have be extensively studied. Among them, the development of efficient blue phosphor remains a challenging task. In view of the close correlation between 5d-4f transitions of rare earth ions and the coordination environment of host lattice, many studies have been dedicated to improving the photoluminescence performances by modifying the lattice coordination environment including the lattice rigidity and symmetry. In this work, we reported highly efficient blue-emitting Eu2+-doped BaAI(12)O(19) (BAO) phosphors with excellent thermal stability, which were prepared via the traditional high-temperature solid state reaction routes. According to the X-ray powder diffraction (XRD) Rietveld refinement analysis, BAO owned a highly symmetric layer structure with two Ba polyhedrons, marked as Ba(1)O(9 )and Ba(2)O-10 , respectively. The diffuse reflectance spectra revealed the optical band gap to be 4.07 eV. Due to the suitable optical bandgap, the Eu2+ ions could realize a highly efficient doping in the BAO matrix. The photoluminescence excitation (PLE) spectra for asprepared BAO:Eu2+ phosphors exhibited a broad absorption band in the region from 250 to 430 nm, matching well with the n-UV LED chip. Under the UV radiation, it is highly luminous (internal quantum yields (IQYs) = 90%) with the peak around 443 nm. Furthermore, the color purity of BAO:Eu2+ phosphors could achieve 92%, ascribing to the narrow full width at halfmaximum (fwhm = 52 nm), which was even much better than that of commercially available BAM:Eu 2+ phosphor (color purity = 91.34%, fwhm = 51.7 nm). More importantly, the as-prepared BAO:Eu2+ phosphor showed extra high thermal stability when working in the region of 298-550 K, which was a bit better than that of commercial BAM:Eu2+ phosphors. According to the distortion calculation of Ba crystallographic occupation, the superior thermal stability could be attributed to the highly symmetric crystal structure of BAO host. In view of the excellent luminescence performances of BAO:Eu2+, it is a promising blue-emitting phosphor for n-UV WLED.

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标题: Life cycle assessment and environmental cost accounting of coal-fired power generation in China

作者: Wang, JM (Wang, Jinman); Wang, RG (Wang, Ruogu); Zhu, YC (Zhu, Yucheng); Li, JY (Li, Jiayan)

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摘要: It is necessary to analyze the environmental impact of the entire process of coal-fired power generation to take effective measures for controlling energy consumption and reducing pollutant emission. However, very few studies have examined the coal mining, washing and transportation stages in the life cycle of coal-fired power generation and it's environmental cost. In this study, the life cycle assessment (LCA) method was adopted to analyze the environmental impact of coal-fired power generation in China. Further, the relevant cost theory was used to calculate the resource consumption cost and external environmental cost of coal-fired power generation. The key environmental impact category was smoke and dust, and the main emissions were CO2, CO, SO2, TSP, COD, and boiler ash. The emissions with high environmental cost were coal, SO2, COD, and boiler ash. The environmental cost at the power generation stage was the highest, with a value of $50.24. The resource consumption cost and external environmental cost per unit of MWh power in the life cycle was $46.01 and $22.90, respectively. Upgrading the facilities for emission reduction, improving emission standards of pollutants, and strengthening process management of coal-fired power generation are effective ways to reduce the burden on the environment.

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作者关键词: Coal-fired power generation; Life cycle assessment; Environmental impact; Resource consumption cost; External environmental cost

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作者: Xiao, ML (Xiao, Meiling); Zhu, JB (Zhu, Jianbing); Ma, L (Ma, Liang); Jin, Z (Jin, Zhao); Ge, J (Ge, Junjie); Deng, XJ (Deng, Xin); Hou, Y (Hou, Yang); He, QG (He, Qinggang); Li, JK (Li, Jingkun); Jia, QY (Jia, Qingying); Mukerjee, S (Mukerjee, Sanjeev); Yang, R (Yang, Ruoou); Jiang, Z (Jiang, Zheng); Su, DS (Su, Dangsheng); Liu, CP (Liu, Changpeng); Xing, W (Xing, Wei)

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摘要: Developing highly efficient, low-cost oxygen reduction catalysts, especially in acidic medium, is of significance toward fuel cell commercialization. Although pyrolyzed Fe-N-C catalysts have been regarded as alternatives to platinum based catalytic materials, further improvement requires precise control of the Fe-N-x structure at the molecular level and a comprehensive understanding of catalytic site structure and the ORR mechanism on these materials. In this report, we present a microporous metal-organic-framework-confined strategy toward the preferable formation of single-atom dispersed catalysts. The onset potential for Fe-N-C is 0.92 V, comparable to that of Pt/C and outperforming most noble-metal-free catalysts ever reported. A high-spin Fe3+-N-4 configuration is revealed by the Fe-57 Mossbauer spectrum and X-ray absorption spectroscopy for Fe L-edge, which will convert to Fe2+-N-4 at low potential. The in situ reduced Fe2+-N-4 moiety from high-spin O-x-Fe3+-N-4 contributes to most of the ORR activity due to its high turnover frequency (TOF) of ca. 1.71 e s(-1) sites(-1).

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文献类型: Article

作者关键词: oxygen reduction reaction; single atom; electrocatalyst; active site; X-ray absorption spectroscopy

KeyWords Plus: OXYGEN REDUCTION REACTION; ELECTROLYTE FUEL-CELLS; NITROGEN-DOPED GRAPHENE; FE/N/C-CATALYSTS; CARBON ELECTROCATALYSTS; TRANSITION-METAL; IRON; EFFICIENT; COBALT; PHTHALOCYANINE

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标题: Progress in enhancement of CO2 absorption by nanofluids: A mini review of mechanisms and current status

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摘要: Nanotechnology is a new technique which is widely applied in several energy systems. The novel process of CO2 absorption or conversion enhancement using nanofluids receives significant attention in recent decades. A comprehensive literature review on CO2 absorption enhancement by nanofluids is here compiled. This present review covers the nanofluids preparation methods, enhancement mechanisms, and the enhancement factors of the gas-liquid system. The nanofluids parameters and fluid flow rates effects on the enhancement of CO2 absorption are discussed and highlighted. Moreover, this review indicates that the CO2-nanofluids system is a promising technique for gas pollution control. However, a lot of future works are needed to increase the absorption behavior and performance of the nanofluids as well as reduce the energy consumption during the capture process. (C) 2017 Elsevier Ltd. All rights reserved.

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作者: Cheng, Y (Cheng, Yong); Dai, J (Dai, Jun); Sun, CL (Sun, Chunli); Liu, R (Liu, Rui); Zhai, TY (Zhai, Tianyou); Lou, XD (Lou, Xiaoding); Xia, F (Xia, Fan)

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摘要: Inflammatory cells have gained widespread attention because inflammatory diseases increase the risk for many types of cancer. Therefore, it is urgent and important to implement detection and treatment methods for inflammatory cells. Herein, we constructed a theranostic probe with aggregation-induced emission (AIE) characteristics, in which tetraphenylethene (TPE) was modified with two tyrosine (Tyr) moieties. Owing to the H2O2-dependent, enzyme-catalyzed dityrosine formation, Tyr-containing TPE (TT) molecules crosslink through dityrosine linkages to induce the formation of hydrophobic aggregates, activating the AIE process in inflammatory cells that contain H2O2 and overexpress myeloperoxidase. The emission turn-on resulting from the crosslinking of TT molecules could be used to distinguish between inflammatory and normal cells. Moreover, the massive TT aggregates induced mitochondria damage and cell apoptosis. This study demonstrates that the H2O2-responsive peroxidase-activated AIEgen holds great promise for inflammatory-cell selective imaging and inhibition.

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作者: Tschauner, O (Tschauner, O.); Huang, S (Huang, S.); Greenberg, E (Greenberg, E.); Prakapenka, VB (Prakapenka, V. B.); Ma, C (Ma, C.); Rossman, GR (Rossman, G. R.); Shen, AH (Shen, A. H.); Zhang, D (Zhang, D.); Newville, M (Newville, M.); Lanzirotti, A (Lanzirotti, A.); Tait, K (Tait, K.)

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摘要: Water-rich regions in Earth's deeper mantle are suspected to play a key role in the global water budget and the mobility of heat-generating elements. We show that ice-VII occurs as inclusions in natural diamond and serves as an indicator for such water-rich regions. Ice-VII, the residue of aqueous fluid present during growth of diamond, crystallizes upon ascent of the host diamonds but remains at pressures as high as 24 gigapascals; it is now recognized as a mineral by the International Mineralogical Association. In particular, ice-VII in diamonds points toward fluid-rich locations in the upper transition zone and around the 660-kilometer boundary.

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作者: Fan, LD (Fan, Liangdong); Zhu, B (Zhu, Bin); Su, PC (Su, Pei-Chen); He, CX (He, Chuanxin)

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摘要: Solid oxide fuel cells (SOFCs) show considerable promise for meeting the current ever-increasing energy demand and environmental sustainability requirements because of their high efficiency, low environmental impact, and distinct fuel diversity. In the past few decades, extensive R&D efforts have been focused on lowering operational temperatures in order to decrease the system (stack and balance-of-plant) cost and improve the longevity of operationally useful devices of commercial relevance. Nanomaterials and related nanotechnologies have the potential to improve SOFC performance because of their advantageous functionalities, namely, their enlarged surface area and unique surface and interface properties compared to their microscale analogs. Recently, the use of nanomaterials has increased rapidly, as reflected by the exponential growth in the number of publications since 2002. In this work, we present a comprehensive summary of nanoparticles, nano-thin films and nanocomposites with different crystal phases, morphologies, microstructures, electronic properties, and electrochemical performances for low temperature SOFCs (LT-SOFCs), with focus on efforts to enhance electrical efficiency, to induce novel fundamental properties that are inaccessible in microcrystalline materials, and to promote the commercialization of LT-SOFCs. Recent progress in the applications of many classically or newly chemical and physical nanomaterials and nanofabrication techniques, such as thin film vacuum deposition, impregnation, electrospinning, spark plasma sintering, hard-and soft-template methods, and in-situ nanoparticle surface exsolution are also thoroughly described. The technological and scientific advantages and limitations related to the use of nanomaterials and nanotechnologies are highlighted, along with our expectations for future research within this emerging field.

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作者: Zhou, C (Zhou, Chao); Yin, KL (Yin, Kunlong); Cao, Y (Cao, Ying); Ahmed, B (Ahmed, Bayes); Li, YY (Li, Yuanyao); Catani, F (Catani, Filippo); Pourghasemi, HR (Pourghasemi, Hamid Reza)

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摘要: Landslide is a common natural hazard and responsible for extensive damage and losses in mountainous areas. In this study, Longju in the Three Gorges Reservoir area in China was taken as a case study for landslide susceptibility assessment in order to develop effective risk prevention and mitigation strategies. To begin, 202 landslides were identified, including 95 colluvial landslides and 107 rockfalls. Twelve landslide causal factor maps were prepared initially, and the relationship between these factors and each landslide type was analyzed using the information value model. Later, the unimportant factors were selected and eliminated using the information gain ratio technique. The landslide locations were randomly divided into two groups: 70% for training and 30% for verifying. Two machine learning models: the support vector machine (SVM) and artificial neural network (ANN), and a multivariate statistical model: the logistic regression (LR), were applied for landslide susceptibility modeling (LSM) for each type. The LSM index maps, obtained from combining the assessment results of the two landslide types, were classified into five levels. The performance of the LSMs was evaluated using the receiver operating characteristics curve and Friedman test. Results show that the elimination of noise-generating factors and the separated modeling of each landslide type have significantly increased the prediction accuracy. The machine learning models outperformed the multivariate statistical model and SVM model was found ideal for the case study area.

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标题: Unraveling the Mechanisms of Visible Light Photocatalytic NO Purification on Earth-Abundant Insulator-Based Core-Shell Heterojunctions

作者: Wang, H (Wang, Hong); Sun, YJ (Sun, Yanjuan); Jiang, GM (Jiang, Guangming); Zhang, YX (Zhang, Yuxin); Huang, HW (Huang, Hongwei); Wu, ZB (Wu, Zhongbiao); Lee, SC (Lee, S. C.); Dong, F (Dong, Fan)

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摘要: Earth-abundant insulators are seldom exploited as photocatalysts. In this work, we constructed a novel family of insulator-based heterojunctions and demonstrated their promising applications in photocatalytic NO purification, even under visible light irradiation. The heterojunction formed between the insulator SrCO3 and the photosensitizer BiOI, via a special SrCO3-BiOI core-shell structure, exhibits an enhanced visible light absorbance between 400-600 nm, and an unprecedentedly high photocatalytic NO removal performance. Further density functional theory (DFT) calculations and X-ray photoelectron spectroscopy (XPS) analysis revealed that the covalent interaction between the O 2p orbital of the insulator (SrCO3, n-type) and the Bi 6p orbital of photosensitizer (BiOI, p-type) can provide an electron transfer channel between SrCO3 and BiOI, allowing the transfer of the photoexcited electrons from the photosensitizer to the conduction band of insulator (confirmed by charge difference distribution analysis and time-resolved fluorescence spectroscopy). The center dot O-2(-) and center dot OH radicals are the main reactive species in photocatalytic NO oxidation. A reaction pathway study based on both in situ FT-IR and molecular-level simulation of NO adsorption and transformation indicates that this heterojunction can efficiently transform NO to harmless nitrate products via the NO -> NO+ and NO2+-> nitrate or nitrite routes. This work provides numerous opportunities to explore earth-abundant insulators as visible-light-driven photocatalysts, and also offers a new mechanistic understanding of the role of gas-phase photocatalysis in controlling air pollution.

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标题: Global land-water nexus: Agricultural land and freshwater use embodied in worldwide supply chains

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摘要: As agricultural land and freshwater inextricably interrelate and interact with each other, the conventional water and land policy in "silos" should give way to nexus thinking when formulating the land and water management strategies. This study constructs a systems multi-regional input-output (MRIO) model to expound global land-water nexus by simultaneously tracking agricultural land and freshwater use flows along the global supply chains. Furthermore, land productivity and irrigationwater requirements of 160 crops in different regions are investigated to reflect the land-water linkage. Results show that developed economies (e.g., USA and Japan) and major large developing economies (e.g., mainland China and India) are the overriding drivers of agricultural land and freshwater use globally. In general, significant net transfers of these two resources are identified from resource-rich and less-developed economies to resource-poor and more-developed economies. For some crops, bluewater productivity is inversely related to land productivity, indicating that irrigationwater consumption is sometimes at odds with land use. The results could stimulus international cooperation for sustainable land and freshwater management targeting on original suppliers and final consumers along the global supply chains. Moreover, crop-specific land-water linkage could provide insights for trade-off decisions on minimizing the environmental impacts on local land and water resources. (C) 2017 Elsevier B.V. All rights reserved.

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标题: A NEW METHOD FOR CALCULATING FRACTAL DIMENSIONS OF POROUS MEDIA BASED ON PORE SIZE DISTRIBUTION

作者: Xia, YX (Xia, Yuxuan); Cai, JC (Cai, Jianchao); Wei, W (Wei, Wei); Hu, XY (Hu, Xiangyun); Wang, X (Wang, Xin); Ge, XM (Ge, Xinmin)

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摘要: Fractal theory has been widely used in petrophysical properties of porous rocks over several decades and determination of fractal dimensions is always the focus of researches and applications by means of fractal-based methods. In this work, a new method for calculating pore space fractal dimension and tortuosity fractal dimension of porous media is derived based on fractal capillary model assumption. The presented work establishes relationship between fractal dimensions and pore size distribution, which can be directly used to calculate the fractal dimensions. The published pore size distribution data for eight sandstone samples are used to calculate the fractal dimensions and simultaneously compared with prediction results from analytical expression. In addition, the proposed fractal dimension method is also tested through Micro-CT images of three sandstone cores, and are compared with fractal dimensions by box-counting algorithm. The test results also prove a self-similar fractal range in sandstone when excluding smaller pores.

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作者: Li, X (Li, Xin); Cheng, GD (Cheng, Guodong); Ge, YC (Ge, Yingchun); Li, HY (Li, Hongyi); Han, F (Han, Feng); Hu, XL (Hu, Xiaoli); Tian, W (Tian, Wei); Tian, Y (Tian, Yong); Pan, XD (Pan, Xiaoduo); Nian, YY (Nian, Yanyun); Zhang, YL (Zhang, Yanlin); Ran, YH (Ran, Youhua); Zheng, Y (Zheng, Yi); Gao, B (Gao, Bing); Yang, DW (Yang, Dawen); Zheng, CM (Zheng, Chunmiao); Wang, XS (Wang, Xusheng); Liu, SM (Liu, Shaomin); Cai, XM (Cai, Ximing)

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摘要: Endorheic basins around the world are suffering from water and ecosystem crisis. To pursue sustainable development, quantifying the hydrological cycle is fundamentally important. However, knowledge gaps exist in how climate change and human activities influence the hydrological cycle in endorheic basins. We used an integrated ecohydrological model, in combination with systematic observations, to analyze the hydrological cycle in the Heihe River Basin, a typical endorheic basin in arid region of China. The water budget was closed for different landscapes, river channel sections, and irrigation districts of the basin from 2001 to 2012. The results showed that climate warming, which has led to greater precipitation, snowmelt, glacier melt, and runoff, is a favorable factor in alleviating water scarcity. Human activities, including ecological water diversion, cropland expansion, and groundwater overexploitation, have both positive and negative effects. The natural oasis ecosystem has been restored considerably, but the overuse of water in midstream and the use of environmental flow for agriculture in downstream have exacerbated the water stress, resulting in unfavorable changes in surface-ground water interactions and raising concerns regarding how to fairly allocate water resources. Our results suggest that the water resource management in the region should be adjusted to adapt to a changing hydrological cycle, cropland area must be reduced, and the abstraction of groundwater must be controlled. To foster long-term benefits, water conflicts should be handled from a broad socioeconomic perspective. The findings can provide useful information on endorheic basins to policy makers and stakeholders around the world.

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摘要: Charge transfer pathway and catalysis mechanism are two major issues in a specific catalytic reaction process. To further probe these two aspects of photocatalytic NO oxidation to address the environmental problem, Bi metal@defective BiOBr hierarchical microspheres were fabricated and used as a visible light photocatalyst. The interfacial and surface properties of Bi metal@defective BiOBr were optimized to understand the SPR effect of Bi metal and the oxygen vacancies (OVs) formed in situ. It was found that the charge transfer pathway on Bi metal@defective BiOBr has been significantly changed from that on pristine BiOBr. The Bi semimetal could act both as a charge transfer bridge and as a hot electron donor. The OVs induced the formation of an intermediate level in the band structure of BiOBr and promote O-2 activation and thus the generation of center dot O-2(-) species. Due to the synergistic effects of Bi metal and OVs, Bi metal@defective BiOBr demonstrated highly enhanced visible light photocatalytic performance for NO removal. The photocatalytic NO oxidation process has been monitored by in situ diffuse reflectance infrared Fourier transform spectroscopy (DRIFTS), which could reveal the reaction intermediate products accurately. On the basis of an investigation with in situ DRIFTS and the simulation of the electronic structure, a new photocatalysis mechanism involving Bi metal, OVs, and NO transformation was proposed. The perspectives on the charge transfer pathway and photocatalysis mechanism in the present work can be extended to other catalysts for tuning the interfacial properties and enhancing the photocatalytic performance to address environmental problems. (C) 2017 Elsevier Inc. All rights reserved.

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标题: Secure and Robust Fragile Watermarking Scheme for Medical Images

作者: Shehab, A (Shehab, Abdulaziz); Elhoseny, M (Elhoseny, Mohamed); Muhammad, K (Muhammad, Khan); Sangaiah, AK (Sangaiah, Arun Kumar); Yang, P (Yang, Po); Huang, HJ (Huang, Haojun); Hou, GL (Hou, Guolin)

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摘要: Due to the advances in computer-based communication and health services over the past decade, the need for image security becomes urgent to address the requirements of both safety and non-safety in medical applications. This paper proposes a new fragile watermarking-based scheme for image authentication and self-recovery for medical applications. The proposed scheme locates image tampering as well as recovers the original image. A host image is broken into 4 x 4 blocks and singular value decomposition (SVD) is applied by inserting the traces of block wise SVD into the least significant bit of the image pixels to figure out the transformation in the original image. Two authentication bits namely block authentication and self-recovery bits are used to survive the vector quantization attack. The insertion of self-recovery bits is determined with Arnold transformation, which recovers the original image even after a high tampering rate. SVD-based watermarking information improves the image authentication and provides away to detect different attacked area of the watermarked image. The proposed scheme is tested against different types of attacks such as text removal attack, text insertion attack, and copy and paste attack. Compared with the state-of-the art methods, the proposed scheme greatly improves both tamper localization accuracy and the peak signal to noise ratio of self-recovered image.

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文献类型: Article

作者关键词: Medical image security; tamper localization; singular value decomposition; fragile watermarking; arnold transformation; image security; authentication

KeyWords Plus: WIRELESS CAPSULE ENDOSCOPY; AUTHENTICATION; OWNERSHIP; FRAMEWORK; SIGNATURE; DOMAIN; SVD

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标题: Material composition, pore structure and adsorption capacity of low-rank coals around the first coalification jump: A case of eastern Junggar Basin, China

作者: Tao, S (Tao, Shu); Chen, SD (Chen, Shida); Tang, DZ (Tang, Dazhen); Zhao, X (Zhao, Xu); Xu, H (Xu, Hao); Li, S (Li, Song)

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摘要: The first coalification jump (FCJ) has a significant impact on low-rank coal reservoir heterogeneity, and is of great importance for coalbed methane (CBM) development. Here, a series of experiments were performed for 10 coal samples collected from eastern Junggar Basin, to compare the material composition, pore structure and adsorption capacity of lignite and candle coal. Contrast with the candle coal, the lignite has a higher inertinite content, larger pore volume, better connectivity, and greater specific surface area (SSA). During the process of FCJ, the polycondensation of coal molecules and the compaction of coal matrix occur, leading to a rapid decline of moisture, porosity and permeability, and the cell wall in the candle coal is badly crushed with clay minerals filled from optical microscopy. In general, the larger total pore volume (1.7-300 nm, measured by N-2 adsorption) contributes to the larger SSA. The SSA of candle coal mainly comes from the contribution of micropore (< 10 nm), especially the 2-3 nm pores, while the micropore and transition pore (10-100 nm) contribute to most of SSA of lignite. However, though the SSA of the candle coal is largely lower than that of the lignite, the CH4 adsorption capacity tends to decrease from the lignite to the candle coal due to material composition difference. Low-field NMR was used to determine the pore and fracture system by analyzing the transverse relaxation time, which showed that only two obvious peaks could be identified in lignite and three peaks at about 0.25 ms, 30 ms and 200 ms are present in the candle coal. The fractal results indicate that the pore surface and complexity inside the coal increase gradually from lignite to candle coal. These observations could deepen awareness and understanding of low-rank coal reservoir heterogeneity and the influence of FCJ on reservoir property.

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作者关键词: Coalification jump; Material composition; Pore structure; Adsorption capacity; Low-rank coal; Eastern Junggar Basin

KeyWords Plus: CARBON-DIOXIDE ADSORPTION; FRACTAL CHARACTERIZATION; METHANE; GEOCHEMISTRY; PERMEABILITY; REFLECTANCE; MOISTURE; GASES; AREA

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标题: Shape-, size- and structure-controlled synthesis and biocompatibility of iron oxide nanoparticles for magnetic theranostics

作者: Xie, WS (Xie, Wensheng); Guo, ZH (Guo, Zhenhu); Gao, F (Gao, Fei); Gao, Q (Gao, Qin); Wang, D (Wang, Dan); Liaw, BS (Liaw, Bor-shuang); Cai, Q (Cai, Qiang); Sun, XD (Sun, Xiaodan); Wang, XM (Wang, Xiumei); Zhao, LY (Zhao, Lingyun)

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摘要: In the past decade, iron oxide nanoparticles (IONPs) have attracted more and more attention for their excellent physicochemical properties and promising biomedical applications. In this review, we summarize and highlight recent progress in the design, synthesis, biocompatibility evaluation and magnetic theranostic applications of IONPs, with a special focus on cancer treatment. Firstly, we provide an overview of the controlling synthesis strategies for fabricating zero-, one- and three-dimensional IONPs with different shapes, sizes and structures. Then, the in vitro and in vivo biocompatibility evaluation and biotranslocation of IONPs are discussed in relation to their chemo-physical properties including particle size, surface properties, shape and structure. Finally, we also highlight significant achievements in magnetic theranostic applications including magnetic resonance imaging (MRI), magnetic hyperthermia and targeted drug delivery. This review provides a background on the controlled synthesis, biocompatibility evaluation and applications of IONPs as cancer theranostic agents and an overview of the most up-to-date developments in this area.

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语言: English

文献类型: Review

作者关键词: iron oxide; controlled synthesis; biocompatibility; magnetic theranostics

KeyWords Plus: MRI CONTRAST AGENT; FE3O4 NANOPARTICLES; IN-VIVO; SURFACE MODIFICATION; HOLLOW SPHERES; CANCER-CELLS; HYDROTHERMAL SYNTHESIS; ABSORPTION RATE; HYPERTHERMIA; MONODISPERSE

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标题: Building Extraction in Very High Resolution Remote Sensing Imagery Using Deep Learning and Guided Filters

作者: Xu, YY (Xu, Yongyang); Wu, L (Wu, Liang); Xie, Z (Xie, Zhong); Chen, ZL (Chen, Zhanlong)

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摘要: Very high resolution (VHR) remote sensing imagery has been used for land cover classification, and it tends to a transition from land-use classification to pixel-level semantic segmentation. Inspired by the recent success of deep learning and the filter method in computer vision, this work provides a segmentation model, which designs an image segmentation neural network based on the deep residual networks and uses a guided filter to extract buildings in remote sensing imagery. Our method includes the following steps: first, the VHR remote sensing imagery is preprocessed and some hand-crafted features are calculated. Second, a designed deep network architecture is trained with the urban district remote sensing image to extract buildings at the pixel level. Third, a guided filter is employed to optimize the classification map produced by deep learning; at the same time, some salt-and-pepper noise is removed. Experimental results based on the Vaihingen and Potsdam datasets demonstrate that our method, which benefits from neural networks and guided filtering, achieves a higher overall accuracy when compared with other machine learning and deep learning methods. The method proposed shows outstanding performance in terms of the building extraction from diversified objects in the urban district.

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文献类型: Article

作者关键词: building extraction; deep learning; guided filter; very high resolution

KeyWords Plus: CONVOLUTIONAL NEURAL-NETWORKS; SEMANTIC SEGMENTATION; CLASSIFICATION; AERIAL; REGION

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标题: Honeycomb-like structured biological porous carbon encapsulating PEG: A shape-stable phase change material with enhanced thermal conductivity for thermal energy storage

作者: Zhao, YJ (Zhao, Yajing); Min, X (Min, Xin); Huang, ZH (Huang, Zhaohui); Liu, YG (Liu, Yan'gai); Wu, XW (Wu, Xiaowen); Fang, MH (Fang, Minghao)

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摘要: Shape-stable and high-thermal conductivity composite phase change materials (c-PCMs) composed of polyethylene glycol (PEG) and biological porous carbon (BPC) are investigated. BPC based on potatoes and white radishes are obtained by the carbonization method. The thermal conductivity of the BPC increases with the rising of the carbonization temperature due to the higher graphitization degree. Especially, BPC calcined at 1300 degrees C for 2 h resulted in the optimum PEG supporting matrix candidate, showing an attractive honeycomb-like microstructure. Calcination above 1300 degrees C results in the destruction of the shape. BPC/PEG c-PCMs are synthesized via a vacuum impregnation approach. PEG equally distributed in the matrix material with a mass fraction of 85.36% approximately and it could keep its morphological stability after heating at 80 degrees C for 40 h. Moreover, the highest thermal conductivity is 4.5 W/m K, which is about 10 times higher than the pristine PEG. Furthermore, no chemical interaction is found between the PEG and BPC. The melting and solidifying temperature, and enthalpy not vary upon a 200 thermal cycles test. This confirms the excellent chemical and structure stability for c-PCMs, which are within the most promising materials in the area of building heat preservation by being clean, energy-saving and recycled materials. (C) 2017 Elsevier B.V. All rights reserved.

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文献类型: Article

作者关键词: Honeycomb-like structure; Biological porous carbon; PEG; Shape stabilization; Thermal conductivity reinforcement

KeyWords Plus: POLYETHYLENE-GLYCOL; PORE STRUCTURE; COMPOSITE; VERMICULITE; FOAMS

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作者: Huang, HW (Huang, Hongwei); Cao, RR (Cao, Ranran); Yu, SX (Yu, Shixin); Xu, K (Xu, Kang); Hao, WC (Hao, Weichang); Wang, YG (Wang, Yonggang); Dong, F (Dong, Fan); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe)

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摘要: Single-layer catalysis sparks huge interests and gains widespread attention owing to its high activity. Simultaneously, three-dimensional (3D) hierarchical structure can afford large surface area and abundant reactive sites, contributing to high efficiency. Herein, we report an absorbing single-unit-cell layer established Bi2WO6 3D hierarchical architecture fabricated by a sodium dodecyl benzene sulfonate (SDBS)-assisted assembled strategy. The DBS- long chains can adsorb on the (Bi2O2)(2+) layers and hence impede stacking of the layers, resulting in the single-unit-cell layer. We also uncovered that SDS with a shorter chain is less effective than SDBS. Due to the sufficient exposure of surface O atoms, single-unit-cell layer 3D Bi2WO6 shows strong selectivity for adsorption on multiform organic dyes with different charges. Remarkably, the single-unit-cell layer 3D Bi2WO6 casts profoundly enhanced photodegradation activity and especially a superior photocatalytic H-2 evolution rate, which is 14-fold increase in contrast to the bulk Bi2WO6. Systematic photoelectrochemical characterizations disclose that the substantially elevated carrier density and charge separation efficiency take responsibility for the strengthened photocatalytic performance. Additionally, the possibility of single-unit-cell layer 3D Bi2WO6 as dye-sensitized solar cells (DSSC) has also been attempted and it was manifested to be a promising dye-sensitized photoanode for oxygen evolution reaction (ORR). Our work not only furnish an insight into designing single-layer assembled 3D hierarchical architecture, but also offer a multi-functional material for environmental and energy applications. (C) 2017 Elsevier B.V. All rights reserved.

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标题: Well-designed 3D ZnIn2S4 nanosheets/TiO2 nanobelts as direct Z-scheme photocatalysts for CO2 photoreduction into renewable hydrocarbon fuel with high efficiency

作者: Yang, G (Yang, Guang); Chen, DM (Chen, Daimei); Ding, H (Ding, Hao); Feng, JJ (Feng, Jiejie); Zhang, JZ (Zhang, Jin Z.); Zhu, YF (Zhu, Yongfa); Hamid, S (Hamid, Saher); Bahnemann, DW (Bahnemann, Detlef W.)

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摘要: A 3-dimensional (3D) ZnIn2S4/TiO2 Z-scheme system has been designed and constructed for photocatalytic reduction of CO2 into renewable hydrocarbon fuels without the use of a solid-state electron mediator. The unique 3D morphology, achieved by assembling 2D ZnIn2S4 nanosheets onto 1D TiO2 nanobelts, not only provides large surface area but also improves the separation and transfer efficiency of photogenerated electrons and holes. The 3D ZnIn2S4/TiO2 Z-scheme photocatalysts show excellent light-harvesting properties demonstrated in photocatalytic reduction of CO2, resulting in generation of desired hydrocarbons. The CH4 production rate of the 3D ZnIn2S4/TiO2 can reach up to 1.135 mu mol g(-1) h(-1) which is about 39-times higher than that of bare ZnIn2S4 (0.029 mu mol g(-1) h(-1)). The enhanced photocatalytic activity is attributed to effective separation of the charge carriers between ZnIn2S4 and TiO2 through the direct Z-scheme instead of a type-II heterojunction. The photogenerated electrons in TiO2 nanobelts recombine with the holes in ZnIn2S4 nanosheets, and the unrecombined electrons/holes on different active sites have stronger reduction/oxidation abilities, leading to higher photocatalytic activity for CO2 reduction. (C) 2017 Published by Elsevier B.V.

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作者关键词: TiO2; ZnIn2S4; Z-Scheme system; Three-dimensional structure

KeyWords Plus: STATE Z-SCHEME; VISIBLE-LIGHT; HYDROGEN EVOLUTION; TIO2 NANOPARTICLES; H-2 PRODUCTION; ELECTRON MEDIATOR; FACILE SYNTHESIS; ANATASE TIO2; PERFORMANCE; REDUCTION

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输出日期: 2022-01-19

标题: Nonaqueous Hybrid Lithium-Ion and Sodium-Ion Capacitors

作者: Wang, HW (Wang, Huanwen); Zhu, CR (Zhu, Changrong); Chao, DL (Chao, Dongliang); Yan, QY (Yan, Qingyu); Fan, HJ (Fan, Hong Jin)

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摘要: Hybrid metal-ion capacitors (MICs) (M stands for Li or Na) are designed to deliver high energy density, rapid energy delivery, and long lifespan. The devices are composed of a battery anode and a supercapacitor cathode, and thus become a tradeoff between batteries and supercapacitors. In the past two decades, tremendous efforts have been put into the search for suitable electrode materials to overcome the kinetic imbalance between the batterytype anode and the capacitor-type cathode. Recently, some transition-metal compounds have been found to show pseudocapacitive characteristics in a nonaqueous electrolyte, which makes them interesting high-rate candidates for hybrid MIC anodes. Here, the material design strategies in Li-ion and Na-ion capacitors are summarized, with a focus on pseudocapacitive oxide anodes (Nb2O5, MoO3, etc.), which provide a new opportunity to obtain a higher power density of the hybrid devices. The application of Mxene as an anode material of MICs is also discussed. A perspective to the future research of MICs toward practical applications is proposed to close.

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作者关键词: hybrid batteries; kinetic imbalance; lithium-and sodium-ion capacitors; metal-ion capacitors; pseudocapacitive

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标题: An extended reciprocally convex matrix inequality for stability analysis of systems with time-varying delay

作者: Zhang, CK (Zhang, Chuan-Ke); He, Y (He, Yong); Jiang, L (Jiang, Lin); Wu, M (Wu, Min); Wang, QG (Wang, Qing-Guo)

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摘要: The reciprocally convex combination lemma (RCCL) is an important technique to develop stability criteria for the systems with a time-varying delay. This note develops an extended reciprocally convex matrix inequality, which reduces the estimation gap of the RCCL-based matrix inequality and reduces the number of decision variables of the recently proposed delay-dependent RCCL. A stability criterion of a linear time delay system is established through the proposed matrix inequality. Finally, a numerical example is given to demonstrate the advantage of the proposed method. (C) 2017 Elsevier Ltd. All rights reserved.

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作者关键词: Time-delay system; Time-varying delay; Extended reciprocally convex matrix inequality; Stability

KeyWords Plus: DEPENDENT STABILITY; ROBUST STABILITY; CRITERIA

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标题: Tectonic evolution, superimposed orogeny, and composite metallogenic system in China

作者: Deng, J (Deng, Jun); Wang, QF (Wang, Qingfei); Li, GJ (Li, Gongjian)

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摘要: Continental China is a mosaic of numerous tectonic blocks, which amalgamated from Neoarchean to Cenozoic broadly coeval with the cycles of global supercontinents such as Kenorland, Columbia, Rodinia, Gondwana, and Pangaea. By reviewing the long-lasting geological evolution in the different tectonic blocks, it reveals that more than two episodes of tectonic events, including accretionary and collisional orogeny, and dismantling, as well as mantle plume, occurred successively or simultaneously within a single tectonic belt. This is called superimposed orogeny in this study. Examples of the dominant types of superimposed orogeny in China include: (1) Cenozoic continental collision superimposed on Paleo- to Mesozoic accretionary orogeny in the Tibet and Sanjiang orogenic belts; (2) Reactivation of Paleozoic accretionary orogen in later Mesozoic oceanic subduction in the eastern part of Qinling-Qilian-Kunlun and Central Asian orogenic belts; (3) Mesozoic oceanic subduction under the paleo-suture in the South China Block; (4) Mesozoic demantling along the Paleo- and Neoproterozoic, and Paleozoic sutures in the eastern part of North China Craton; and (5) mantle plume rising through metasomatized lithospheric mantle or stagnant oceanic slab in the Emeishan large igneous province. A comprehensive review of the spatial-temporal distribution of ore deposits and their salient features shows that the superimposed orogeny has exerted significant control on metallogeny in China. The giant porphyry and skarnore deposits, as well as orogenic gold deposits were preferentially formed along previous tectonic suture, craton margin, and arc during later orogenesis due to the remobilization of previously enriched metals. Superimposed orogeny has reworked the lithospheric structure with concomitant granitoid-associated metallogeny. The mixing of magmas from juvenile lower crust, ancient lower crust, and middle crust, which tends to induce the different mineralization of Cu-Au, Mo, and Pb-Zn-W-Sn deposits respectively, was considered to generate a wide variety of combinations of metal species. The superimposed orogeny caused the overlapping of diverse genetic types of deposit formed in different tectonic periods in the same tectono-metallogenic belt. The stratiform ore deposit, including BIF, VMS, SEDEX, or sedimentary sulfide layers, formed from Neoarchean to Paleozoic, were modified by later mineralization, resulting in the enrichment of the various metal species and enhancement of ore resources. This study brings up the concept of composite metallogenic system to summarize the regional metallogeny driven by superimposed orogeny. The composite metallogenic system was dominantly characterized by the multi-episodic and diverse mineralization concomitant with one or more features, including mineralization evolved from the previous metal enrichment, later overlapping or modification on previous ore belt, and diversifying of metal species derived from reworked lithosphere. (C) 2017 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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文献类型: Review

作者关键词: Composite ore system; Superimposed orogeny; Continental collision; Adakite; Supercontinents; China tectonics

KeyWords Plus: ZIRCON U-PB; PORPHYRY COPPER-DEPOSIT; LARGE IGNEOUS PROVINCE; METAMORPHIC CORE COMPLEX; MASSIVE SULFIDE DEPOSIT; MOLYBDENITE RE-OS; ND-HF ISOTOPES; CU-MO DEPOSIT; GRANULITE-FACIES METAMORPHISM; BEARING ULTRAMAFIC INTRUSION

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作者: Meert, JG (Meert, Joseph G.); Santosh, M (Santosh, M.)

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摘要: Just over 15 years ago, a proposal forwarded by Rogers and Santosh (2002) posited the existence of a pre-Rodinia supercontinent which they called Columbia. The conjecture invigorated research into the Paleo-Mesoproterozoic interval that was; in our opinion, inappropriately dubbed 'the boring billion'. Given the wealth of new information about the supercontinent, this review paper takes a careful look at the paleomagnetic evidence that is used to reconstruct Columbia. Our contribution represents a status report and indicates that; despite the exponential increase in available data, knowledge of the assembly, duration and breakup history of the supercontinent are contentious. The commonality of similar to 1.7-2.1 Ga orogenic systems around the globe are indicative of major changes in paleogeography and growth of larger landmasses. There is continued discussion about the interconnectedness of those orogenic systems in a global picture. Arguments for Columbia posit a similar to 1500-1400 Ma age for maximum packing. Paleomagnetic data from many of the constituent cratons during the 1500-1400 Ma interval can be interpreted to support a large landmass, but the consistency of the proposal cannot be reliably demonstrated for earlier or later times. One of the more intriguing advances are the apparent long-lived connections between Laurentia, Siberia and Baltica that may have formed the core of both Columbia and Rodinia. (C) 2017 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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标题: Notes on Stability of Time-Delay Systems: Bounding Inequalities and Augmented Lyapunov-Krasovskii Functionals

作者: Zhang, CK (Zhang, Chuan-Ke); He, Y (He, Yong); Jiang, L (Jiang, Lin); Wu, M (Wu, Min)

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摘要: The bounding inequalities and the LyapunovKrasovskii functionals (LKFs) are important for the stability analysis of time-delay systems. Much attention has been paid to develop tighter inequalities for improving stability criteria, while the contribution of the LKFs has not been considered when discussing the relationship between the tightness of inequalities and the conservatism of criteria. This note is concerned with this issue. Firstly, it is proved that, when a simple LKF is applied, the stability criteria obtained by the Wirtinger-based inequality and the Jensen inequality are equivalent although the Wirtinger-based inequality is tighter. It means that the tighter inequality does not always lead to a less conservative criterion. Secondly, it is found that a suitable augmented LKF with necessary integral vectors in its derivative is required to achieve the advantage of the Wirtingerbased inequality. Based on this observation, two delay-producttype terms are introduced into the LKF to establish new stability criteria. Finally, a numerical example is given to verify the equivalence statements and to show the benefit of the proposed criteria.

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语言: English

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作者关键词: Augmented Lyapunov-Krasovskii functional; bounding inequalities; stability; time-delay system

KeyWords Plus: H-INFINITY CONTROL; DEPENDENT STABILITY; INTEGRAL-INEQUALITIES; ROBUST STABILITY; VARYING DELAY; CRITERIA; EQUIVALENCE; IMPROVEMENT

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标题: Stability Analysis of Discrete-Time Neural Networks With Time-Varying Delay via an Extended Reciprocally Convex Matrix Inequality

作者: Zhang, CK (Zhang, Chuan-Ke); He, Y (He, Yong); Jiang, L (Jiang, Lin); Wang, QG (Wang, Qing-Guo); Wu, M (Wu, Min)

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摘要: This paper is concerned with the stability analysis of discrete-time neural networks with a time-varying delay. Assessment of the effect of time delays on system stability requires suitable delay-dependent stability criteria. This paper aims to develop new stability criteria for reduction of conservatism without much increase of computational burden. An extended reciprocally convex matrix inequality is developed to replace the popular reciprocally convex combination lemma (RCCL). It has potential to reduce the conservatism of the RCCL-based criteria without introducing any extra decision variable due to its advantage of reduced estimation gap using the same decision variables. Moreover, a delay-product-type term is introduced for the first time into the Lyapunov function candidate such that a delay-variation-dependent stability criterion with the bounds of delay change rate is established. Finally, the advantages of the proposed criteria are demonstrated through two numerical examples.

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语言: English

文献类型: Article

作者关键词: Delay-product-type Lyapunov function; discrete-time neural networks; extended reciprocally convex matrix inequality; interval time-varying delay; stability

KeyWords Plus: GLOBAL EXPONENTIAL STABILITY; ROBUST STABILITY; SYSTEMS; CRITERIA; DISSIPATIVITY

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输出日期: 2022-01-19

标题: Recent advances in interfacial engineering of perovskite solar cells

作者: Ye, MD (Ye, Meidan); He, CF (He, Chunfeng); Iocozzia, J (Iocozzia, James); Liu, XQ (Liu, Xueqin); Cui, X (Cui, Xun); Meng, XT (Meng, Xiangtong); Rager, M (Rager, Matthew); Hong, XD (Hong, Xiaodan); Liu, XY (Liu, Xiangyang); Lin, ZQ (Lin, Zhiqun)

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摘要: Due to recent developments, organometallic halide perovskite solar cells (PSCs) have attracted even greater interest owing to their impressive photovoltaic properties and simple device manufacturing processes with the potential for commercial applications. The power conversion efficiencies (PCEs) of PSCs have surged from 3.8% for methyl ammonium lead halide-sensitized liquid solar cells, CH3NH3PbX3 (X = Cl, Br, I), in 2009, to more than 22% for all-solid-state solar cells in 2016. Over the past few years, significant effort has been dedicated to realizing PSCs with even higher performance. In this review, recent advances in the interfacial engineering of PSCs are addressed. The specific strategies for the interfacial engineering of PSCs fall into two categories: (1) solvent treatment and additives to improve the light-harvesting capabilities of perovskite films, and (2) the incorporation of various functional materials at the interfaces between the active layers (e.g. electron transporting layer, perovskite layer, and hole transporting layer). This review aims to provide a comprehensive overview of strategies for the interfacial engineering of PSCs with potential benefits including enhanced light harvesting, improved charge separation and transport, improved device stability, and elimination of photocurrent hysteresis.

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KeyWords Plus: SOLUTION-PROCESSED PEROVSKITE; POWER CONVERSION EFFICIENCY; HOLE-TRANSPORTING MATERIAL; LEAD IODIDE PEROVSKITES; CATHODE BUFFER LAYER; OPEN-CIRCUIT VOLTAGE; AL-DOPED ZNO; HIGH-PERFORMANCE; HIGHLY EFFICIENT; CH3NH3PBI3 PEROVSKITE

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标题: Macroscopic Polarization Enhancement Promoting Photo- and Piezoelectric-Induced Charge Separation and Molecular Oxygen Activation

作者: Huang, HW (Huang, Hongwei); Tu, SC (Tu, Shuchen); Zeng, C (Zeng, Chao); Zhang, TR (Zhang, Tierui); Reshak, AH (Reshak, Ali H.); Zhang, YH (Zhang, Yihe)

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摘要: Efficient photo- and piezoelectric-induced molecular oxygen activation are both achieved by macroscopic polarization enhancement on a noncentrosymmetric piezoelectric semiconductor BiOIO3. The replacement of V5+ ions for I5+ in IO3 polyhedra gives rise to strengthened macroscopic polarization of BiOIO3, which facilitates the charge separation in the photocatalytic and piezoelectric catalytic process, and renders largely promoted photo- and piezoelectric induced reactive oxygen species (ROS) evolution, such as superoxide radicals (O-.(2)-) and hydroxyl radicals ((OH)-O-.). This work advances piezoelectricity as a new route to efficient ROS generation, and also discloses macroscopic polarization engineering on improvement of multi-responsive catalysis.

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作者关键词: BiOIO3; macroscopic polarization; molecular oxygen activation; photocatalysis; piezoelectric catalysis

KeyWords Plus: INTERNAL POLAR FIELD; VISIBLE-LIGHT; ANTIBACTERIAL PROPERTIES; BARIUM-TITANATE; PHOTOCATALYSIS; NANOPARTICLES; FABRICATION; CAPABILITY; NANOSHEETS; DYNAMICS

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标题: Self-assembly of exfoliated molybdenum disulfide (MoS2) nanosheets and layered double hydroxide (LDH): Towards reducing fire hazards of epoxy

作者: Zhou, KQ (Zhou, Keqing); Gao, R (Gao, Rui); Qian, XD (Qian, Xiaodong)

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摘要: In present study, LDH/MoS2 hybrids were facilely prepared by self-assembly of exfoliated MoS2 nanosheets and LDH via electrostatic force. The structure and morphology of the LDH/MoS2 hybrids were characterized and then introduced into epoxy for reducing its fire hazards. Compared with single MoS2, LDH/MoS2 hybrids showed a more homogeneous dispersion in the epoxy matrix and no obvious agglomerates were observed. Compared with MoS2, the addition of LDH/MoS2 hybrids endowed more excellent fire resistance to epoxy matrix, which was reflected by the significantly reduced peak heat release rate, total heat release and total smoke production. A rational flame retardant mode of action for LDH/MoS2 hybrids was proposed based on the analysis of pyrolysis fragments and char residues. (C) 2017 Elsevier B.V. All rights reserved.

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文献类型: Article

作者关键词: Fire hazards; Epoxy; Self-assembly; LDH; MoS2 nanosheets

KeyWords Plus: FLAME-RETARDANT; THERMAL-STABILITY; SMOKE SUPPRESSION; POLYSTYRENE COMPOSITES; NANOCOMPOSITES; PERFORMANCE; GRAPHENE; REINFORCEMENT; FABRICATION; IMPROVE

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标题: Template-free precursor-surface-etching route to porous, thin g-C3N4 nanosheets for enhancing photocatalytic reduction and oxidation activity

作者: Huang, HW (Huang, Hongwei); Xiao, K (Xiao, Ke); Tian, N (Tian, Na); Dong, F (Dong, Fan); Zhang, TR (Zhang, Tierui); Du, X (Du, Xin); Zhang, YH (Zhang, Yihe)

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摘要: Metal-free graphitic carbon nitride (g-C3N4) has sparked considerable interest due to its efficient photocatalytic activity in many fields. Development of new tactics toward improving the photocatalytic performance of g-C3N4 remains active and challenging. In this study, we uncover an unprecedented template-free precursor (melamine) pre-treatment protocol to achieve porous g-C3N4 nanosheets for efficient photocatalytic reduction and oxidation reaction. The introduction of thiourea solution in the hydrothermal pre-treatment process etches the surface of melamine, thus yielding the porous, thin g-C3N4 nanosheets. The microstructure and porosity of g-C3N4 can be adjusted only by controlling the thiourea amount. The as-obtained porous g-C3N4 nanosheets are found to be endowed with not only increased specific surface area, but also enhanced photoabsorption in the visible light region. Systematic characterizations of the charge movement behavior (transient photocurrent, linear sweep voltammetry, electrochemical impedance spectra, photoluminescence and surface photovoltage spectroscopy) disclose that the separation of photogenerated charge carriers is remarkably boosted by fabricating such a porous nanosheet structure. Benefiting from these advantages, porous g-C3N4 nanosheets present profoundly enhanced visible-light photocatalytic performance for H-2 evolution (3.3-fold increase) and NO removal from the gaseous phase (5.5 times increase) in contrast to the pristine bulk g-C3N4. Our current study may offer an alternative approach to designing high-performance g-C3N4 nanomaterials for energy and environmental applications.

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KeyWords Plus: CARBON NITRIDE NANOSHEETS; VISIBLE-LIGHT PHOTOCATALYSIS; HYDROGEN EVOLUTION; CHARGE SEPARATION; GRAPHITIC C3N4; QUANTUM DOTS; DOPED G-C3N4; CO2; PHOTOREACTIVITY; HETEROJUNCTION

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标题: Investigation on the pore structure and multifractal characteristics of tight oil reservoirs using NMR measurements: Permian Lucaogou Formation in Jimusaer Sag, Junggar Basin

作者: Zhao, PQ (Zhao, Peiqiang); Wang, ZL (Wang, Zhenlin); Sun, ZC (Sun, Zhongchun); Cai, JC (Cai, Jianchao); Wang, L (Wang, Liang)

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摘要: Pore structure is a critical parameter to estimate the reservoir quality and evaluate the resource potential. However, the pore structure and heterogeneity of the unconventional tight oil reservoirs of Permian Lucaogou Formation of Jimusaer Sag, Junggar Basin are not studied well. In this paper, the multifractal analysis based on the NMR T-2 distributions was applied to investigate the pore structure and heterogeneity. The reservoir quality index (RQI) and flow zone indicator (FZI) were calculated using porosity and permeability. Two parameters T-35 and T-50 were newly defined as relaxation times corresponding to the 35% and 50% saturation on the T-2 reverse accumulative curve, respectively. The results showed that the RQI, and FZI values were extremely low, and that the NMR T-2 distributions of water saturated samples had much short relaxation components with no or little long relaxation components, indicating a complex and poor microscopic pore structure of tight oil rocks. The typical multifractal characteristics, such as the large values of singularity strength range (Delta alpha), revealed that the pore structures of samples were strongly heterogeneous. It was also found that the clay contents have an obvious influence on the multifractal parameters, and the FZI and new defined T-35 are two good indicators for heterogeneity of pore structure. In addition, the feasibility and applicability of calculating the multifractal parameters from NMR and other well logs were discussed. (C) 2017 Elsevier Ltd. All rights reserved.

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语言: English

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作者关键词: Lucaogou tight oil reservoirs; Pore structure; Multifractal analysis; NMR measurements

KeyWords Plus: SICHUAN BASIN; FRACTAL DIMENSION; LONGMAXI SHALE; GAS-RESERVOIR; POROUS-MEDIA; CHINA; PERMEABILITY; MODEL; SIZE; LOGS

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标题: Electrical conductivity models in saturated porous media: A review

作者: Cai, JC (Cai, Jianchao); Wei, W (Wei, Wei); Hu, XY (Hu, Xiangyun); Wood, DA (Wood, David A.)

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摘要: Electrical transport properties of saturated porous media, such as soils, rocks and fractured networks, typically composed of a non-conductive solid matrix and a conductive brine in the pore space, have numerous applications in reservoir engineering and petrophysics. One of the widely used electrical conductivity models is the empirical Archie's law that has a practical application in well-log interpretation of reservoir rocks. The Archie equation does not take into account the contributions of clay minerals, isolated porosity, heterogeneity in grains and pores and their distributions, as well as anisotropy. In the literature, either some modifications were presented to apply Archie's law to tight and clay-rich reservoirs or more modern models were developed to describe electrical conductivity in such reservoirs. In the former, a number of empirically derived parameters were proposed, which typically vary from one reservoir to another. In the latter, theoretical improvements by including detailed characteristics of pore space morphology led to developing more complex electrical conductivity models. Such models enabled us to address the electrical properties in a wider range of potential reservoir rocks through theoretical parameters related to key reservoir-defining petrophysical properties. This paper presents a review of the electrical conductivity models developed using fractal, percolation and effective medium theories. Key results obtained by comparing experiential and theoretical models with experiments/simulations, as well as advantages and drawbacks of each model are analyzed. Approaches to obtaining more reasonable electrical conductivity models are discussed. Experiments suggest more complex relationships between electrical conductivity and porosity than experiential models, particularly in low-porosity formations. However, the available theoretical models combined with simulations do provide insight to how microscale physics affects macroscale electrical conductivity in porous media.

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语言: English

文献类型: Review

作者关键词: Electrical conductivity; Porous media; Fractal model; Percolation theory; Effective medium approximation; Pore-network model

KeyWords Plus: FORMATION RESISTIVITY FACTORS; CARBONATE RESERVOIR ROCKS; CRITICAL PATH-ANALYSIS; SEDIMENTARY-ROCKS; ARCHIES LAW; SHALY SANDS; TRANSPORT-PROPERTIES; LABORATORY DATA; SIERPINSKI CARPETS; PERCOLATION THEORY

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标题: Precursor-reforming protocol to 3D mesoporous g-C3N4 established by ultrathin self-doped nanosheets for superior hydrogen evolution

作者: Tian, N (Tian, Na); Zhang, YH (Zhang, Yihe); Li, XW (Li, Xiaowei); Xiao, K (Xiao, Ke); Du, X (Du, Xin); Dong, F (Dong, Fan); Waterhouse, GIN (Waterhouse, Geoffrey I. N.); Zhang, TR (Zhang, Tierui); Huang, HW (Huang, Hongwei)

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摘要: Graphitic carbon nitride (g-C3N4) has attracted enormous research attention as a promising low cost, visible-light driven semiconductor photocatalyst. However, low photoabsorption efficiencies and unsatisfactory charge separation limit the potential of g-C3N4 in many applications, motivating attempts to manipulate the structure and electronic properties of g-C3N4 to achieve improved performance. Here we describe a novel precursor-reforming strategy that ultimately affords 3D mesoporous ultrathin g-C3N4 with superior photocatalytic performance compared to conventional calcination-derived g-C3N4. We demonstrate that during hydrothermal treatment of melamine and urea, melamine undergoes an irreversible monoclinic to orthorhombic phase transformation, and the additive urea (excess typically 3-fold) serves as an additional N source and porogen. Calcination of the orthorhombic melamine yields mesoporous g-C3N4 with enhanced photoabsorption properties and an outstanding photoactivity. A 23-fold increased hydrogen evolution rate of 3579 mu mol h(-1) g(-1) (lambda > 420 nm) was achieved with an apparent quantum efficiency (AQE) of 27.8% at 420 +/- 15 nm, a level of performance far beyond any AQE previously reported for ultrathin/porous/doped g-C3N4 photocatalyst. Our work conclusively demonstrates a new synthetic strategy towards high performance g-C3N4-based photocatalytic materials for energy applications.

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语言: English

文献类型: Article

作者关键词: g-C3N4; Ultrathin nanosheets; Porous structure; N self-doping; Photocatalytic hydrogen production

KeyWords Plus: GRAPHITIC CARBON NITRIDE; VISIBLE-LIGHT; PHOTOCATALYTIC ACTIVITY; METAL; WATER; CO2; REDUCTION; TIO2; H-2; PHOTOREACTIVITY

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作者: Zeng, HB (Zeng, Hong -Bing); Teo, KL (Teo, Kok Lay); He, Y (He, Yong)

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摘要: In this paper, a new two-sided looped-functional is introduced for stability analysis of sampled-data systems. The functional fully utilizes the information on both the intervals x(t) to x(t(k)) and x(t) to x(t(k+1)). Based on the two-sided functional, an improved stability condition is derived in the form of linear matrix inequality (LMI). Numerical examples show that the result computed by the presented condition approximates nearly the theoretical bound (bound obtained by eigenvalue analysis) and outperforms substantially others in the existing literature. (C) 2017 Elsevier Ltd. All rights reserved.

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作者关键词: Sampled-data systems; Stability; Lyapunov functional; Linear matrix inequality

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标题: 3D-3D porous Bi2WO6/graphene hydrogel composite with excellent synergistic effect of adsorption-enrichment and photocatalytic degradation

作者: Yang, JJ (Yang, Jinjin); Chen, DM (Chen, Daimei); Zhu, Y (Zhu, Yi); Zhang, YM (Zhang, Yuanming); Zhu, YF (Zhu, Yongfa)

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摘要: A novel visible-light 3D-3D Bi2WO6/graphene hydrogel (BWO/GH) photocatalyst with the synergistic effect of adsorption and photocatalysis has been successfully synthesized by a facile one-step hydrothermal method and is applied in environment remediation. 3D porous graphene hydrogel, in which 3D-structured flower-like BWO as an efficient photocatalyst is homogenously distributed, not only exhibits the great absorption toward the organic pollution, but also provides multidimensional quality and electron transfer channels. The 3D-3D structure of BWO/GH composite is beneficial to light refraction and reflection, which highly improves the utilization rate of light. The synergistic effect of the 3D-3D BWO/GH composite greatly enhanced the removal rates of organic pollutants and it is ease of separation and recycling in water purification. The removal rate of methylene blue (MB) by BWO/GH composite is about 2.3 times as that of the pure BWO in static systems, and the removal rates of MB and 2, 4-dichlorophenol (2, 4-CDP) are about 1.3 and 3 times as these of the pure BWO in dynamic system. When the irradiation time lasted for 74h, the removal rate of MB is nearly unchanged and still kept at 36.1%, indicating that the 3D BWO/GH composite has a high stability. The construction of BWO/GH composite resolved the adsorption saturation problem of GH and improved the photocatalytic activity of BWO, thus greatly improved the removal rate of water pollutants. (C) 2016 Elsevier B.V. All rights reserved.

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作者关键词: Bi2WO6; Graphene hydrogel; 3D-3D structure; Synergy; Photocatalysis

KeyWords Plus: METAL ADSORPTION; HIGHLY EFFICIENT; IN-SITU; GRAPHENE; BI2WO6; REMOVAL; WATER; DYE; SEPARATION; REDUCTION

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作者: Guo, HX (Guo Haixiang); Li, YJ (Li Yijing); Shang, J (Shang, Jennifer); Gu, MY (Gu Mingyun); Huang, YY (Huang Yuanyue); Bing, G (Bing, Gong)

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摘要: Rare events, especially those that could potentially negatively impact society, often require humans' decision-making responses. Detecting rare events can be viewed as a prediction task in data mining and machine learning communities. As these events are rarely observed in daily life, the prediction task suffers from a lack of balanced data. In this paper, we provide an in depth review of rare event detection from an imbalanced learning perspective. Five hundred and seventeen related papers that have been published in the past decade were collected for the study. The initial statistics suggested that rare events detection and imbalanced learning are concerned across a wide range of research areas from management science to engineering. We reviewed all collected papers from both a technical and a practical point of view. Modeling methods discussed include techniques such as data preprocessing, classification algorithms and model evaluation. For applications, we first provide a comprehensive taxonomy of the existing application domains of imbalanced learning, and then we detail the applications for each category. Finally, some suggestions from, the reviewed papers are incorporated with our experiences and judgments to offer further research directions for the imbalanced learning and rare event detection fields. (C) 2016 Elsevier Ltd. All rights reserved.

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作者: Cai, JC (Cai, Jianchao); Wei, W (Wei, Wei); Hu, XY (Hu, Xiangyun); Liu, RC (Liu, Richeng); Wang, JJ (Wang, Jinjie)

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摘要: Fracture network and fractured porous media as well as their transport properties have received great attentions in many fields from engineering application and basic theoretical researches. Fracture will dynamically extend in length and aperture to form complex fracture network under some external conditions such as percussion drilling, wave propagation, desiccation and hydrofracturing. The complexity of fracture network can be well quantitatively characterized by fractal dimension. In this work, the dynamic characterization of fracture network extension in porous media under drying process is measured by the improved box-counting technique, and fractal dimensions of fracture network are respectively related to drying time, average aperture, moisture content and fracture porosity. The fractal dimension increases exponentially with drying time and average aperture, and decreases with moisture content in the form of power law. Specially, the fractal dimension is approximatively increased with porosity in the form of linearity in a narrow porosity range. The transport capacity of fracture network, described by seepage coefficient, is also related to the fractal dimension with drying time in the form of exponential function. The presented fractal analysis of fracture network could also shed light on the hydrofracturing application in subsurface unconventional oil and gas reservoirs.

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作者关键词: Fracture Network; Fractal; Porous Media; Dynamic Characterization; Fracture Extension

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标题: Characteristics of pore structure and fractal dimension of low-rank coal: A case study of Lower Jurassic Xishanyao coal in the southern Junggar Basin, NW China

作者: Fu, HJ (Fu, Haijiao); Tang, DZ (Tang, Dazhen); Xu, T (Xu, Ting); Xu, H (Xu, Hao); Tao, S (Tao, Shu); Li, S (Li, Song); Yin, ZY (Yin, ZhenYong); Chen, BL (Chen, Baoli); Zhang, C (Zhang, Cheng); Wang, LL (Wang, Linlin)

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摘要: In this study, a series of laboratory experiments were performed to firstly analyze the characteristics of the pore structure in low-rank coal (R-o < 0.70%), and then relationships between fractal dimensions and coal rank, coal composition and pore structure, and their impacts on methane adsorbability and seepage ability were studied too. The desorption isotherms of low-rank coal mainly belongs to Type B, which are primarily caused by ink-bottle-shaped and narrow-slit pores that are good for coalbed methane (CBM) enrichment, but bad for seepage. The seepage pores are dominated by primary plant macropores (>1000 nm), with a poor development of mesopores (100-1000 nm). The fractal features of adsorbed pores and seepage pores were defined and calculated using fractal dimensions D-2 (2.563-2.926) and D-4 (2.683-3.263), respectively. D-2 has a positive correlation with moisture content, while D-4 has a positive correlation with Ro and fixed carbon and a negative correlation with the volatile content. Both D-2 and D-4 have a weaker association with the ash yield and no apparent relationship with coal macerals, indicating that coal-forming materials and environments have little influence on the pore structure fractal characteristics. D-2 has a strongly correlation with the BET surface area (R-2 = 0.9026) and the average pore diameter (R-2 = 0.9841), again proving that D-2 can be used to characterize the pore structure fractal dimension of adsorbed pores. D-2 shows a negative correlation with the Langmuir volume (VI), but no apparent relationship with the Langmuir pressure (P-L), indicating that the pore structure of absorbed pores has little effect on methane desorption during the process of CBM exploitation. D-4 has weak positive correlation with permeability. Overall, fractal analysis is beneficial for better understanding the pore structure, methane adsorbability and seepage ability of low-rank coal. (C) 2016 Elsevier Ltd. All rights reserved.

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标题: Rational design on 3D hierarchical bismuth oxyiodides via in situ self-template phase transformation and phase-junction construction for optimizing photocatalysis against diverse contaminants

作者: Huang, HW (Huang, Hongwei); Xiao, K (Xiao, Ke); Zhang, TR (Zhang, Tierui); Dong, F (Dong, Fan); Zhang, YH (Zhang, Yihe)

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摘要: Design of three-dimensional (3D) hierarchical architectures and nano-phase-junctions are of huge significance for semiconductor photocatalysis. Herein, we report the fabrication of a series of 3D hierarchical bismuth oxyiodides via in situ phase transformation and phase-junction construction utilizing BiOI microspheres as self-sacrificed template through a facile calcination strategy. The multiform bismuth oxyiodides obtained at different temperatures include hierarchical BiOI, Bi4O5I2, Bi4O5I2-Bi5O7I phase junction and Bi5O7I. These bismuth oxyiodides exhibit very distinct microstructure and band structure, and their photoabsorption was orderly tuned from 700 to 400 nm, rendering the adjustable oxidation and reduction ability of band energy levels. The photocatalytic activity of the bismuth oxyiodide series is systematically assessed by degradation of diverse antibiotic and contaminants, such as tetracycline hydrochloride, bisphenol A (BPA) and azo dye Rhodamine B (RhB). It disclosed that they present discrepant photocatalytic performance with activity order of Bi4O5I2-Bi5O7I>Bi4O5I2 > Bi5O7I > BiOI, which is closely associated with the charge separation efficiency, band structure and surface area. Additionally, the photocatalytic mechanism and degradation pathway are also surveyed. The study may furnish new insights into development of novel 3D hierarchical architectures and nano-phase-junctions for heterogeneous photocatalysis. (C) 2016 Elsevier B.V. All rights reserved.

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作者: Liu, CY (Liu, Chengyin); Zhang, YH (Zhang, Yihe); Dong, F (Dong, Fan); Reshak, AH (Reshak, A. H.); Ye, LQ (Ye, Liqun); Pinna, N (Pinna, Nicola); Zeng, C (Zeng, Chao); Zhang, TR (Zhang, Tierui); Huang, HW (Huang, Hongwei)

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摘要: Metal-free graphitic carbon nitride (g-C3N4) shows tremendous potentials in energy and environmental domains. Nonetheless, amelioration on the crystal configuration, electronic structure and microstructure of g-C3N4 for high-performing visible-light photocatalysis is still challenging and anticipated. Here we report the development of chlorine (Cl) intercalated g-C3N4 via co-pyrolysis of melamine and excessive ammonium chloride (excessive is very pivotal). This protocol renders not only Cl intercalation in the interlayer of g-C3N4, but also a homogeneous porous structure, thereby endowing g-C3N4 with multiple superiority effects, including significantly promoted charge migration by establishing interlayer pathway, up-shifted conduction-band level, narrowed band gap as well as enhanced surface area. The as-prepared CI intercalated mesoporous g-C3N4 parades outstanding photocatalytic performance for water splitting into H-2, CO2 reduction, liquid and air contaminants removal. The most enhanced photocatalytic performance was obtained at Cl-C3N4-3 for H-2 evolution activity, which shows a 19.2-fold increase in contrast to pristine g-C3N4, accompanying with a high apparent quantum efficiency of 11.9% at 420 +/- 15 nm. Experimental and OFT calculations results co-disclose that the aforementioned advantageous factors account for the profoundly boosted photooxidation and photoreduction capabilities of g-C3N4 under visible light. The present work may furnish a bottom-up tactic for integrally advancing g-C3N4, and also hold huge promise to be extended to other layered materials for photochemical or photoelectrochemical applications. (C) 2016 Elsevier B.V. All rights reserved.

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标题: A survey of swarm intelligence for dynamic optimization: Algorithms and applications

作者: Mavrovouniotis, M (Mavrovouniotis, Michalis); Li, CH (Li, Changhe); Yang, SX (Yang, Shengxiang)

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摘要: Swarm intelligence (SI) algorithms, including ant colony optimization, particle swarm optimization, bee inspired algorithms, bacterial foraging optimization, firefly algorithms, fish swarm optimization and many more, have been. proven to be good methods to address difficult optimization problems under stationary environments. Most SI algorithms have been developed to address stationary optimization problems and hence, they can converge on the (near-) optimum solution efficiently. However, many real-world problems have a dynamic environment that changes over time. For such dynamic optimization problems (DOPs), it is difficult for a conventional SI algorithm to track the changing optimum once the algorithm has converged on a solution. In the last two decades, there has been a growing interest of addressing DOPs using SI algorithms due to their adaptation capabilities. This paper presents a broad review on Si dynamic optimization (SIDO) focused on several classes of problems, such as discrete, continuous, constrained, multi-objective and classification problems, and real-world applications. In addition, this paper focuses on the enhancement strategies integrated in SI algorithms to address dynamic changes, the performance measurements and benchmark generators used in SIDO. Finally, some considerations about future directions in the subject are given.

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标题: Multi-step ahead electricity price forecasting using a hybrid model based on two-layer decomposition technique and BP neural network optimized by firefly algorithm

作者: Wang, DY (Wang, Deyun); Luo, HY (Luo, Hongyuan); Grunder, O (Grunder, Olivier); Lin, YB (Lin, Yanbing); Guo, HX (Guo, Haixiang)

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摘要: In the deregulated competitive electricity market, the price which reflects the relationship between electricity supply and demand is one of the most important elements, making it crticial for all market participants to precisely forecast the electricity price. However, electricity price series usually has complex features such as non-linearity, non-stationarity and volatility, which makes the price forecasting turn out to be very difficult. In order to improve the accuracy of electricity price forecasting, this paper first proposes a two-layer decomposition technique and then develops a hybrid model based on fast ensemble empirical mode decomposition (FEEMD), variational mode decomposition (VMD) and back propagation (BP) neural network optimized by firefly algorithm (FA). The proposed model is unique in the sense that VMD is specifically applied to further decompose the high frequency intrinsic mode functions (IMFs) generated by FEEMD into a number of modes in order to improve the forecast accuracy. To validate the effectiveness and accuracy of the proposed model, three electricity price series respectively collected from the real-world electricity markets of Australia and France are adopted to conduct the empirical study. The results indicate that the proposed model outperforms the other considered models over horizons of one-step, two-step, four-step and six-step ahead forecasting, which shows that the proposed model has superior performances for both one-step and multi-step ahead forecasting of electricity price. (C) 2016 Elsevier Ltd. All rights reserved.

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KeyWords Plus: SUPPORT VECTOR MACHINES; DEMAND; SYSTEM; EEMD

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作者: Wang, JL (Wang, Jianlong); Bai, ZY (Bai, Zhiyong)

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摘要: Catalytic ozonation utilizes catalysts to improve the decomposition of ozone and the formation of hydroxyl radicals, which can overcome some disadvantages of ozonation. Fe-based materials are widely used as catalysts for heterogeneous catalytic ozonation due to their easy preparation, excellent catalytic performance and the abundance of Fe in nature. In this paper, the performances of Various Fe-based catalysts, including Fe-0-derived, FeOOH-derived, Fe2O3-derived, Fe3O4-derived and iron oxides composite, their preparation and characterization methods were briefly introduced. The catalytic ozonation using Fe based catalysts for the degradation of various emerging contaminants, such as pesticides and herbicides, pharmaceuticals, phthalic acid esters, dyes, nitrobenzenes, phenols, as well as for the treatment of actual wastewater was summarized. The main influencing factors on catalytic ozonation of toxic organic pollutants were discussed, and their potential applications and perspectives were proposed. (C) 2016 Elsevier B.V. All rights reserved.

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作者关键词: Advanced oxidation processes; Catalytic ozonation; Fe-based catalyst; Emerging contaminants; Wastewater treatment

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作者: Chen, J (Chen, Jian); Loeb, S (Loeb, Stephanie); Kim, JH (Kim, Jae-Hong)

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摘要: The UV-light emitting diode (LED) has been attracting significant attention as a new UV source that can replace conventional mercury gas-filled lamps in water disinfection applications. However, the UV-LED remains a relatively new addition to the water treatment toolbox. The current lack of fundamental understanding risks underutilizing uniquely advantageous features of the UV-LED due to unguided design and non-optimized disinfection practices. Our review presents the necessary fundamental knowledge required for the successful implementation of UV-LEDs, including the mechanism of light generation, LED chip fabrication, package design, and essential properties of UV-LEDs. We introduce distinct advantages, such as wavelength tuning, control of radiation patterns, and array design, while emphasizing the significant differences between LED and mercury lamp technologies required to achieve successful technology transfer. Previous studies investigated the design of UV-LED disinfection systems; however, little consensus has yet emerged regarding the integration of LEDs into flow-through reactors. While UV-LED disinfection systems will undisputedly mature in the near future, environmental engineers face a number of urgent research needs in this area including heat sink design, radiation pattern and array design optimization for uniform UV dose delivery, targeted pathogen-wavelength considerations, improved light extraction, and component monitoring systems.

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作者: Liu, DT (Liu, Dantong); Whitehead, J (Whitehead, James); Alfarra, MR (Alfarra, M. Rami); Reyes-Villegas, E (Reyes-Villegas, Ernesto); Spracklen, DV (Spracklen, Dominick V.); Reddington, CL (Reddington, Carly L.); Kong, SF (Kong, Shaofei); Williams, PI (Williams, Paul I.); Ting, YC (Ting, Yu-Chieh); Haslett, S (Haslett, Sophie); Taylor, JW (Taylor, Jonathan W.); Flynn, MJ (Flynn, Michael J.); Morgan, WT (Morgan, William T.); McFiggans, G (McFiggans, Gordon); Coe, H (Coe, Hugh); Allan, JD (Allan, James D.)

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摘要: Atmospheric black carbon makes an important but poorly quantified contribution to the warming of the global atmosphere. Laboratory and modelling studies have shown that the addition of non-black-carbon materials to black-carbon particles may enhance the particles' light absorption by 50 to 60% by refracting and reflecting light. Real-world experimental evidence for this 'lensing' effect is scant and conflicting, showing that absorption enhancements can be less than 5% or as large as 140%. Here we present simultaneous quantifications of the composition and optical properties of individual atmospheric black-carbon particles. We show that particles with a mass ratio of non-black carbon to black carbon of less than 1.5, which is typical of fresh traffic sources, are best represented as having no absorption enhancement. In contrast, black-carbon particles with a ratio greater than 3, which is typical of biomass-burning emissions, are best described assuming optical lensing leading to an absorption enhancement. We introduce a generalized hybrid model approach for estimating scattering and absorption enhancements based on laboratory and atmospheric observations. We conclude that the occurrence of the absorption enhancement of black-carbon particles is determined by the particles' mass ratio of non-black carbon to black carbon.

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作者: Wei, ZC (Wei, Zhouchao); Moroz, I (Moroz, Irene); Sprott, JC (Sprott, J. C.); Akgul, A (Akgul, Akif); Zhang, W (Zhang, Wei)

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摘要: We report on the finding of hidden hyperchaos in a 5D extension to a known 3D self-exciting homopolar disc dynamo. The hidden hyperchaos is identified through three positive Lyapunov exponents under the condition that the proposed model has just two stable equilibrium states in certain regions of parameter space. The new 5D hyperchaotic self-exciting homopolar disc dynamo has multiple attractors including point attractors, limit cycles, quasi-periodic dynamics, hidden chaos or hyperchaos, as well as coexisting attractors. We use numerical integrations to create the phase plane trajectories, produce bifurcation diagram, and compute Lyapunov exponents to verify the hidden attractors. Because no unstable equilibria exist in two parameter regions, the system has a multistability and six kinds of complex dynamic behaviors. To the best of our knowledge, this feature has not been previously reported in any other high-dimensional system. Moreover, the 5D hyperchaotic system has been simulated using a specially designed electronic circuit and viewed on an oscilloscope, thereby confirming the results of the numerical integrations. Both Matlab and the oscilloscope outputs produce similar phase portraits. Such implementations in real time represent a new type of hidden attractor with important consequences for engineering applications. Published by AIP Publishing.

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摘要: An early extensive Neoproterozoic (ca. 900 Ma) continental magmatic arc system covering hundreds of kilometers has been reported to occur in the South Beishan Orogenic Belt (SBOB) and the Central Tianshan (CTA) in the southern Central Asian Orogenic Belt (CAOB). However, evidence for coeval high-grade metamorphism and thus the formation of an accretionary orogen in the framework of Rodinia is ambiguous or absent. This study provides new petrological, geochemical and geochronological data for garnet-bearing schists (quartz + garnet + biotite + plagioclase +/- muscovite) from the SBOB in order to constrain its Neoproterozoic metamorphic history. The metamorphic zircon rims are either unzoned or display sector zoning in CL-images and reveal REE patterns with flat HREE patterns and negative Eu anomalies, which are interpreted to be in chemical equilibrium with garnet and plagioclase. The zircon U-Pb dating yields concordant U-Pb ages of 900 +/- 3 Ma, 897 +/- 2 Ma and 898 +/- 4 Ma for the metamorphic zircon rims. The inherited detrital zircon cores of one sample display a concordant U-Pb age of 1397 +/- 5 Ma that is consistent with the timing of formation for the extensive Mesoproterozoic continental arc in the SBOB and CTA. Based on phase equilibrium geothermobarometry and average P-T thermobarometric calculations, minimum amphibolite-facies P-T conditions are estimated to be >600 degrees C at pressure >0.6 GPa, which is thought to have been overprinted by subsequent Paleozoic metamorphism. However, the Ti-in-zircon thermometer still reveals temperatures of up to 840 C using the composition of metamorphic zircon rims, suggesting former ca. 900 Ma granulite-facies peak metamorphic temperatures. The combined petrological and geochronological evidence in conjunction with the continental affinity of the regional metamorphic rocks suggests that the SBOB and the eastern CTA experienced an early Neoproterozoic accretionary orogenesis during the final assembly stage of Rodinia. (C) 2017 Elsevier B.V. All rights reserved.

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KeyWords Plus: ZIRCON U-PB; NORTHEASTERN TARIM CRATON; TRACE-ELEMENT; DUNHUANG BLOCK; ACCRETIONARY OROGENESIS; PRESSURE METAMORPHISM; REGIONAL METAMORPHISM; TECTONIC IMPLICATIONS; GRANITIC GNEISSES; MOINE SUPERGROUP

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标题: Recent developments on fractal-based approaches to nanofluids and nanoparticle aggregation

作者: Cai, JC (Cai, Jianchao); Hu, XY (Hu, Xiangyun); Xiao, BQ (Xiao, Boqi); Zhou, YF (Zhou, Yingfang); Wei, W (Wei, Wei)

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摘要: The properties of nanoparticles and its aggregation as well as convective heat transfer of nanofluids have received great attentions over the last few decades. It is well certified that nanoparticles and its aggregation can be successfully described by fractal theory and technology. In this review, the fractal properties of nanoparticle and its aggregation are firstly introduced, and then the recent investigations on the fractal models and fractal-based approaches that applied for effective thermal conductivity, convective heat transfer, critical heat flux and subcooled pool boiling of nanofluids, fractal clusters and yield stress property of nanoparticle aggregation are summarized. (C) 2016 Elsevier Ltd. All rights reserved.

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标题: Noble metal-metal oxide nanohybrids with tailored nanostructures for efficient solar energy conversion, photocatalysis and environmental remediation

作者: Liu, XQ (Liu, Xueqin); Iocozzia, J (Iocozzia, James); Wang, Y (Wang, Yang); Cui, X (Cui, Xun); Chen, YH (Chen, Yihuang); Zhao, SQ (Zhao, Shiqiang); Li, Z (Li, Zhen); Lin, ZQ (Lin, Zhiqun)

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摘要: The controlled synthesis of nanohybrids composed of noble metals (Au, Ag, Pt and Pd, as well as AuAg alloy) and metal oxides (ZnO, TiO2, Cu2O and CeO2) have received considerable attention for applications in photocatalysis, solar cells, drug delivery, surface enhanced Raman spectroscopy and many other important areas. The overall architecture of nanocomposites is one of the most important factors dictating the physical properties of nanohybrids. Noble metals can be coupled to metal oxides to yield diversified nanostructures, including noble metal decorated-metal oxide nanoparticles (NPs), nanoarrays, noblemetal/metal oxide core/shell, noble metal/metal oxide yolk/shell and Janus noble metal-metal oxide nanostructures. In this review, we focus on the significant advances in tailored nanostructures of noble metal-metal oxide nanohybrids. The improvement in performance in the representative solar energy conversion applications including photocatalytic degradation of organic pollutants, photocatalytic hydrogen generation, photocatalytic CO2 reduction, dye-sensitized solar cells (DSSCs) and perovskite solar cells (PSCs) are discussed. Finally, we conclude with a perspective on the future direction and prospects of these controllable nanohybrid materials.

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标题: Detecting Hidden Chaotic Regions and Complex Dynamics in the Self-Exciting Homopolar Disc Dynamo

作者: Wei, ZC (Wei, Zhouchao); Moroz, I (Moroz, Irene); Sprott, JC (Sprott, Julien Clinton); Wang, Z (Wang, Zhen); Zhang, W (Zhang, Wei)

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摘要: In 1979, Moffatt pointed out that the conventional treatment of the simplest self-exciting homopolar disc dynamo has inconsistencies because of the neglect of induced azimuthal eddy currents, which can be resolved by introducing a segmented disc dynamo. Here we return to the simple dynamo system proposed by Moffatt, and demonstrate previously unknown hidden chaotic attractors. Then we study multistability and coexistence of three types of attractors in the autonomous dynamo system in three dimensions: equilibrium points, limit cycles and hidden chaotic attractors. In addition, the existence of two homoclinic orbits is proved rigorously by the generalized Melnikov method. Finally, by using Poincare compactification of polynomial vector fields in three dimensions, the dynamics near infinity of singularities is obtained.

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作者关键词: Homopolar disc dynamo; hidden attractor; multistability and coexistence; homoclinic orbit; dynamics at infinity.

KeyWords Plus: HOMOCLINIC ORBITS; SYSTEM; ATTRACTORS; FLOWS

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标题: Delay-dependent stability analysis of neural networks with time-varying delay: A generalized free-weighting-matrix approach

作者: Zhang, CK (Zhang, Chuan-Ke); He, Y (He, Yong); Jiang, L (Jiang, Lin); Lin, WJ (Lin, Wen-Juan); Wu, M (Wu, Min)

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摘要: This paper investigates the delay-dependent stability problem of continuous neural networks with a bounded time-varying delay via Lyapunov-Krasovskii functional (LKF) method. This paper focuses on reducing the conservatism of stability criteria by estimating the derivative of the LKF more accurately. Firstly, based on several zero-value equalities, a generalized free-weighting-matrix (GFWM) approach is developed for estimating the single integral term. It is also theoretically proved that the GFWM approach is less conservative than the existing methods commonly used for the same task. Then, the GFWM approach is applied to investigate the stability of delayed neural networks, and several stability criteria are derived. Finally, three numerical examples are given to verify the advantages of the proposed criteria. (C) 2016 Elsevier Inc. All rights reserved.

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作者关键词: Neural networks; Time-varying delay; Generalized free-weighting-matrix approach; Stability

KeyWords Plus: GLOBAL ASYMPTOTIC STABILITY; EXPONENTIAL STABILITY; ROBUST STABILITY; INTEGRAL INEQUALITY; DISTRIBUTED DELAYS; LEAKAGE TERM; CRITERIA; DISCRETE; SYSTEMS; DISSIPATIVITY

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作者: Gu, L (Gu, Lin); Zeng, DZ (Zeng, Deze); Guo, S (Guo, Song); Barnawi, A (Barnawi, Ahmed); Xiang, Y (Xiang, Yong)

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摘要: With the recent development in information and communication technology, more and more smart devices penetrate into people's daily life to promote the life quality. As a growing healthcare trend, medical cyber-physical systems (MCPSs) enable seamless and intelligent interaction between the computational elements and the medical devices. To support MCPSs, cloud resources are usually explored to process the sensing data from medical devices. However, the high quality-of-service of MCPS challenges the unstable and long-delay links between cloud data center and medical devices. To combat this issue, mobile edge cloud computing, or fog computing, which pushes the computation resources onto the network edge (e.g., cellular base stations), emerges as a promising solution. We are thus motivated to integrate fog computation and MCPS to build fog computing supported MCPS (FC-MCPS). In particular, we jointly investigate base station association, task distribution, and virtual machine placement toward cost-efficient FC-MCPS. We first formulate the problem into a mixed-integer non-linear linear program and then linearize it into a mixed integer linear programming (LP). To address the computation complexity, we further propose an LP-based two-phase heuristic algorithm. Extensive experiment results validate the high-cost efficiency of our algorithm by the fact that it produces near optimal solution and significantly outperforms a greedy algorithm.

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作者关键词: Mobile edge computing; fog computing; medical cyber physical system; cost efficiency

KeyWords Plus: BASE STATION ASSOCIATION

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标题: Deep carbon cycles constrained by a large-scale mantle Mg isotope anomaly in eastern China

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摘要: Although deep carbon recycling plays an important role in the atmospheric CO2 budget and climate changes through geological time, the precise mechanisms remain poorly understood. Since recycled sedimentary carbonate through plate subduction is the main light-delta Mg-26 reservoir within deep-Earth, Mg isotope variation in mantle-derived melts provides a novel perspective when investigating deep carbon cycling. Here, we show that the Late Cretaceous and Cenozoic continental basalts from 13 regions covering the whole of eastern China have low delta Mg-26 isotopic compositions, while the Early Cretaceous basalts from the same area and the island arc basalts from circum-Pacific subduction zones have mantle-like or heavy Mg isotopic characteristics. Thus, a large-scalemantle low delta Mg-26 anomaly in eastern China has been delineated, suggesting the contribution of sedimentary carbonates recycled into the upper mantle, but limited into the lower mantle. This large-scale spatial and temporal variation ofMg isotopes in the mantle places severe constraints on deep carbon recycling via oceanic subduction.

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作者关键词: Mg isotopes; deep carbon cycling; continental basalts; eastern China; circum-Pacific subduction zones; mantle geochemistry

KeyWords Plus: NORTH CHINA; SUBDUCTION ZONES; 3 GPA; MAGNESIUM; BASALTS; ASTHENOSPHERE; GEOCHEMISTRY; GENESIS; ISLAND; CRUST

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作者: Zhang, MC (Zhang, Mingchao); Wang, CY (Wang, Chunya); Wang, HM (Wang, Huimin); Jian, MQ (Jian, Muqiang); Hao, XY (Hao, Xiangyang); Zhang, YY (Zhang, Yingying)

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摘要: Recent years have witnessed the booming development of flexible strain sensors. To date, it is still a great challenge to fabricate strain sensors with both large workable strain range and high sensitivity. Cotton is an abundant supplied natural material composed of cellulose fibers and has been widely used for textiles and clothing. In this work, the fabrication of highly sensitive wearable strain sensors based on commercial plain weave cotton fabric, which is the most popular fabric for clothes, is demonstrated through a low-cost and scalable process. The strain sensors based on carbonized cotton fabric exhibit fascinating performance, including large workable strain range (> 140%), superior sensitivity (gauge factor of 25 in strain of 0%-80% and that of 64 in strain of 80%-140%), inconspicuous drift, and long-term stability, simultaneously offering advantages of low cost and simplicity in device fabrication and versatility in applications. Notably, the strain sensor can detect a subtle strain of as low as 0.02%. Based on its superior performance, its applications in monitoring both vigorous and subtle human motions are demonstrated, showing its tremendous potential for applications in wearable electronics and intelligent robots.

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作者: Du, JK (Du, Jiangkun); Bao, JG (Bao, Jianguo); Liu, Y (Liu, Ying); Ling, HB (Ling, Haibo); Zheng, H (Zheng, Han); Kim, SH (Kim, Sang Hoon); Dionysiou, DD (Dionysiou, Dionysios D.)

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摘要: A heterogeneous manganese/magnetite/graphene oxide (Mn-MGO) hybrid catalyst was fabricated through the reduction of KMnO4 by ethylene glycol in the presence of magnetite/GO (MGO) particles. The Mn-MGO catalyst exhibited high efficacy and long-term stability in activating peroxymonosulfate (PMS) to generate sulfate radicals for the removal of bisphenol A (BPA) from water. The results of the batch experiments indicated that an increase in the catalyst dose and solution pH could enhance BPA degradation in the coupled Mn-MGO/PMS system. Regardless of the initial pH, the solution pH significantly dropped after the reaction, which was caused by catalytic PMS activation. The production of sulfate radicals and hydroxyl radicals was validated through radical quenching and electron paramagnetic resonances (EPR) tests. BPA degradation pathways were proposed on the basis of LC-MS and GC-MS analyses. Finally, a possible mechanism of catalytic PMS activation was proposed that involved electron transfer from MnO or Mn2O3 to PMS with the generation of sulfate radicals, protons and MnO2, as well as the simultaneous reduction of MnO2 by PMS. (C) 2016 Elsevier B.V. All rights reserved.

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作者关键词: Manganese oxide; Heterogeneous catalysis; Peroxymonosulfate activation; Bisphenol A; Degradation

KeyWords Plus: ENDOCRINE DISRUPTING COMPOUNDS; CATALYTIC PHENOL DEGRADATION; ADVANCED OXIDATION PROCESSES; WASTE-WATER TREATMENT; SULFATE RADICALS; HETEROGENEOUS CATALYSTS; AQUEOUS-SOLUTIONS; ORGANIC POLLUTANTS; GRAPHENE OXIDE; COMPOUNDS EDCS

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作者: Huang, HW (Huang, Hongwei); Xiao, K (Xiao, Ke); He, Y (He, Ying); Zhang, TR (Zhang, Tierui); Dong, F (Dong, Fan); Du, X (Du, Xin); Zhang, YH (Zhang, Yihe)

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摘要: Synthesis of reactive exposing facets and p-n junction are of great importance for semiconductor photo catalysis. Herein, we develop a p-n junction BiOI@Bi12O17Cl2 heterostructure via facilely in situ depositing BiOI nanosheets on the surface of Bi12O17Cl2 plates. Owing to the charge inducement, the BiOI nanosheets are all vertically assembled onto the Bi12O17Cl2 large plates to form a unique front-lateral surfaces coupling heterostructure, which enables high exposure of {001} reactive exposing facets of BiOI. The photocatalytic properties are systematically evaluated by degrading multiform industrial contaminants and antibiotic, like 2,4-dichlorophenol (2,4-DCP), rhodamine B (RhB), phenol, bisphenol A (BPA), and tetracycline hydrochloride. It reveals that the BiOI@Bi12O17Cl2 heterostructure not only shows dramatically strengthened photocatalytic activity, but also unfold powerful and nonselective photooxidation ability under visible-light illumination. The photoelectrochemical characterizations demonstrated that the drastically promoted separation and transfer of charge carriers that derived from the benefits of BiOI {001} active facets and BiOI@Bi12O17Cl2 p-n junction are in charge of the high photo-activity. Detailed radicals detection and quantification experiments further corroborate our conclusions. The study may give us some new hints on designing novel heterostructured photoelectronic materials with integrating p-n junction and active exposing facets. (C) 2016 Elsevier B.V. All rights reserved.

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KeyWords Plus: VISIBLE-LIGHT; SOLVOTHERMAL SYNTHESIS; EFFICIENT; PERFORMANCE; NANOARCHITECTURES; HETEROJUNCTIONS; PHOTOREACTIVITY; DEGRADATION; PHOTOANODES; FABRICATION

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作者: Zeng, DZ (Zeng, Deze); Gu, L (Gu, Lin); Guo, S (Guo, Song); Cheng, ZX (Cheng, Zixue); Yu, S (Yu, Shui)

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摘要: Traditional standalone embedded system is limited in their functionality, flexibility, and scalability. Fog computing platform, characterized by pushing the cloud services to the network edge, is a promising solution to support and strengthen traditional embedded system. Resource management is always a critical issue to the system performance. In this paper, we consider a fog computing supported software-defined embedded system, where task images lay in the storage server while computations can be conducted on either embedded device or a computation server. It is significant to design an efficient task scheduling and resource management strategy with minimized task completion time for promoting the user experience. To this end, three issues are investigated in this paper: 1) how to balance the workload on a client device and computation servers, i.e., task scheduling, 2) how to place task images on storage servers, i.e., resource management, and 3) how to balance the I/O interrupt requests among the storage servers. They are jointly considered and formulated as a mixed-integer nonlinear programming problem. To deal with its high computation complexity, a computation-efficient solution is proposed based on our formulation and validated by extensive simulation based studies.

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作者关键词: Fog computing; software-defined embedded system; task scheduling; resource management; optimization

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标题: Microplastic pollution of lakeshore sediments from remote lakes in Tibet plateau, China

作者: Zhang, K (Zhang, Kai); Su, J (Su, Jing); Xiong, X (Xiong, Xiong); Wu, X (Wu, Xiang); Wu, CX (Wu, Chenxi); Liu, JT (Liu, Jiantong)

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摘要: Tibetan Plateau is known as the world's third pole, which is characterized by a low population density with very limited human activities. Tibetan Plateau possesses the greatest numbers of high-altitude inland lakes in the world. However, no information is currently available on the characteristic of microplastic pollution in those lakes within this remote area. In this work, lakeshore sediments from four lakes within the Siling Co basin in northern Tibet were sampled and examined for microplastics (<5 mm). Microplastics were detected in six out of seven sampling sites with abundances ranging from 8 +/- 14 to 563 +/- 1219 items/m(2). Riverine input might have contributed to the high abundance of microplastics observed in this remote area. Morphological features suggest that microplastics are derived from the breakdown of daily used plastic products. Polyethylene, polypropylene, polystyrene, polyethylene terephthalate, and polyvinyl chloride were identified from the microplastic samples using laser Raman spectroscopy, and oxidative and mechanical weathering textures were observed on the surface of microplastics using scanning electron microscope. These results demonstrate the presence of micro plastics even for inland lakes in remote areas under very low human impact, and microplastic pollution can be a global issue. (C) 2016 Elsevier Ltd. All rights reserved.

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作者关键词: Microplastics; Northern Tibet; Lakeshore sediment; Distribution; Identification; Surface texture

KeyWords Plus: SPATIAL-DISTRIBUTION; MARINE-ENVIRONMENT; SUBTROPICAL GYRE; PLASTIC DEBRIS; GREAT-LAKES; ACCUMULATION; PACIFIC; SHORELINES; INGESTION; BEACHES

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标题: Beyond the Sparsity-Based Target Detector: A Hybrid Sparsity and Statistics-Based Detector for Hyperspectral Images

作者: Du, B (Du, Bo); Zhang, YX (Zhang, Yuxiang); Zhang, LP (Zhang, Liangpei); Tao, DC (Tao, Dacheng)

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摘要: Hyperspectral images provide great potential for target detection, however, new challenges are also introduced for hyperspectral target detection, resulting that hyperspectral target detection should be treated as a new problem and modeled differently. Many classical detectors are proposed based on the linear mixing model and the sparsity model. However, the former type of model cannot deal well with spectral variability in limited endmembers, and the latter type of model usually treats the target detection as a simple classification problem and pays less attention to the low target probability. In this case, can we find an efficient way to utilize both the high-dimension features behind hyperspectral images and the limited target information to extract small targets? This paper proposes a novel sparsity-based detector named the hybrid sparsity and statistics detector (HSSD) for target detection in hyperspectral imagery, which can effectively deal with the above two problems. The proposed algorithm designs a hypothesis-specific dictionary based on the prior hypotheses for the test pixel, which can avoid the imbalanced number of training samples for a class-specific dictionary. Then, a purification process is employed for the background training samples in order to construct an effective competition between the two hypotheses. Next, a sparse representation-based binary hypothesis model merged with additive Gaussian noise is proposed to represent the image. Finally, a generalized likelihood ratio test is performed to obtain a more robust detection decision than the reconstruction residual-based detection methods. Extensive experimental results with three hyperspectral data sets confirm that the proposed HSSD algorithm clearly outperforms the state-of-the-art target detectors.

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作者: Kusky, TM (Kusky, T. M.); Polat, A (Polat, A.); Windley, BF (Windley, B. F.); Burke, KC (Burke, K. C.); Dewey, JF (Dewey, J. F.); Kidd, WSF (Kidd, W. S. F.); Maruyama, S (Maruyama, S.); Wang, JP (Wang, J. P.); Deng, H (Deng, H.); Wang, ZS (Wang, Z. S.); Wang, C (Wang, C.); Fu, D (Fu, D.); Li, XW (Li, X. W.); Peng, HT (Peng, H. T.)

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摘要: Archean cratons have map patterns and rock associations that are diagnostic of the Wilson Cycle. The North China Craton (NCC) consists of several distinctly different tectonic units, but the delineation and understanding of the significance of individual sutures and the rocks between them has been controversial. We present an actualistic tectonic division and evolution of the North China Craton based on Wilson Cycle and comparative tectonic analysis that uses a multi-disciplinary approach in order to define sutures, their ages, and the nature of the rocks between them, to determine their mode of formation and means of accretion or exhumation, and propose appropriate modern analogues. The eastern unit of the craton consists of several different small blocks assembled between 2.6 and 2.7 Ga ago, that resemble fragments of accreted arcs from an assembled archipelago similar to those in the extant SW Pacific. A thick Atlantic-type passive margin developed on the western side of the newly assembled Eastern Block by 2.6-2.5 Ga. A > 1300 km-long arc and accretionary prism collided with the margin of the Eastern Block at 2.5 Ga, obducting ophiolites and ophiolitic melanges onto the block, and depositing a thick clastic wedge in a foreland basin farther into the Eastern Block. This was followed by an arc-polarity reversal, which led to a short-lived injection of mantle wedge-derived melts to the base of the crust that led to the intrusion of mafic dikes and arc-type granitoid (TTG) plutons with associated metamorphism. By 2.43 Ga, the remaining open ocean west of the accreted arc closed with the collision of an oceanic plateau now preserved as the Western Block with the collision-modified margin of the Eastern Block, causing further deformation in the Central Orogenic Belt. 2.4-235 Ga rifting of the newly amalgamated continental block formed a rift along its center, and new oceans within the other two rift arms, which removed a still-unknown continental fragment from its northern margin. By 2.3 Ga an arc collided with a new Atlantic-type margin developed over the rift sequence along the northern margin of the craton, and thus was converted to an Andean margin through arc-polarity reversal.

Andean margin tectonics affected much of the continental block from 2.3 to 1.9 Ga, giving rise to a broad E-W swath of continental margin magmas, and retro-arc sedimentary basins including a foreland basin superimposed on the passive northern margin. The horizontal extent of these tectonic components is similar to that across the present-day Andes in South America. From 1.88 to 1.79 Ga a granulite facies metamorphic event was superimposed across the entire continental block with high-pressure granulites and eclogites in the north, and medium-pressure granulites across the whole craton to the south. The scale and duration of this post-collisional event is similar to that in Central Asia that resulted from the Cenozoic India-Asia collision. The deep crustal granulites and volcanic rocks on the surface today, interpreted to be anatectic melts from deep crustal granulites, are similar to high-grade metamorphic rocks and partial melts presently forming at mid-crustal levels beneath Tibet. Structural fabrics in lower-crustal migmatites related to this event reveal that they flowed laterally parallel to the collision boundary, in a way comparable to what is speculated to be happening in the deep crust of the Himalayan/Tribetan foreland. We relate this continent-continent collision to the collision of the North China Craton with the postulated Columbia (Nuna) Continent. The NCC broke out of the Columbia Continent between 17531673 Ma, as shown by the formation of a suite of anorthosite, mangerite, charnocicite, and alkali-feldspar granites in an ENE-striking belt along the northern margin of the craton, whose intrusion was followed by the development of rifts and graben, mafic dike swarms, and eventually an Atlantic-type passive margin that signaled the beginning of a long period of tectonic quiescence and carbonate deposition for the NCC during Sinian times, which persisted into the Paleozoic. The style of tectonic accretion in the NCC changed at circa 2.5 Ga, from an earlier phase of accretion of arcs that are presently preserved in horizontal lengths of several hundred kilometers, to the accretion and preservation of linear arcs several thousand kilometers long with associated oceanic plateaus, microcontinents, and accretionary prisms. The style of progressively younger and westward outward accretion of different tectonic components is reminiscent of the style of accretion in the Superior Craton, and may signal the formation of progressively larger landmasses at the end of the Archean (perhaps like the Kenorland Continent), then into the Paleoproterozoic, culminating in the assembly of the Columbia (Nuna) Continent at 1.9-1.8 Ga. (C) 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license.

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摘要: Coal has a heterogenous porosity that influences its specific surface area (SSA) and CH4 adsorption and desorption. However, the pore size distribution obtained with N-2 adsorption is only reliable at pore sizes >2 nm omitting the important contribution of micropore (<2 nm). Here, 13 coal samples from three series were measured by both the N-2 at 77 K and CO2 at 273 K, respectively, to compared the adsorption pore structure characteristics of different coal ranks, seams, and macrolithotypes, which further revealed the influences of mesopore (2-50 nm) and micropore on CH4 adsorption capacity at different pore sizes. The larger micropore total pore volume (TPV) contributes to the larger micropore SSA. As micropores are common and contribute extensively to most of the SSA (>99%) in these coals, a much better relationship exists between the Dubinin-Radushkevich (DR) SSA and CH4 adsorption capacity (Langmuir volume). With the increase of the coal rank, the CH4 adsorption capacity increases continuously and the DR SSA shows a tendency of first decreasing then increasing; at the same coal rank, from the bright to dull coal, the vitrinite content as well as the DR SSA and CH4 adsorption capacity decreases; for the three main coal seams in the Hancheng mine area, the No. 11 coal has the largest DR SSA and CH4 adsorption capacity followed by the No. 3 coal and No. 5 coal. With CO2 adsorption, it is more significant than N-2 adsorption to accurately characterize the microscopic structure of coal and understand the gas adsorption mechanism. (C) 2016 Elsevier Ltd. All rights reserved.

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摘要: Electrons can be transferred from microorganisms to multivalent metal ions that are associated with minerals and vice versa. As the microbial cell envelope is neither physically permeable to minerals nor electrically conductive, microorganisms have evolved strategies to exchange electrons with extracellular minerals. In this Review, we discuss the molecular mechanisms that underlie the ability of microorganisms to exchange electrons, such as c-type cytochromes and microbial nanowires, with extracellular minerals and with microorganisms of the same or different species. Microorganisms that have extracellular electron transfer capability can be used for biotechnological applications, including bioremediation, biomining and the production of biofuels and nanomaterials.

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摘要: To describe a low-field nuclear magnetic resonance (NMR) method for quantifying pore-fracture fractal dimensions and their influence on effective porosity and permeability, we performed modeling comparisons between fractal analysis and pore-fracture physical properties in low-rank coals. The adsorption space fractal (D-NMRA), seepage space fractal (D-NMRS) and moveable fluid space fractal (D-NMRM) were calculated to be 1.62-1.91, 2.77-2.98 and 1.56-2.75, respectively. The D-NMRA generally increased with increasing Langmuir volume (V-L, 9.54-31.06 m(3)/t), Langmuir pressure (P-L, 0.58-8.13 MPa), the Brunauer-Emmett-Teller (BET) surface area and its fractal dimension. Higher D-NMRA indicated the significant coalbed methane (CBM) adsorption capability. Both the D-NMRS and D-NMRM decreased with increasing areas of T-2 > 2.5 ms distribution (S-T and S-CT) and sorting coefficient. These phenomena showed that the NMR fractal method could reflect the coal pore-fracture heterogeneity and had significant influence on seepage space content. The correlations of moveable fluid porosity and permeability with D-NMRM can be found by performing the models of y = ax + b (a < 0), so coals with high D-NMRM occur to have low flow capability. Furthermore, the pore-fracture porosity and permeability have positive correlations with ST and SCT, which result from the connection between pores and fractures. These results also show that fractal analysis calculated with T-2 can be developed to appraise the physical properties of low-rank coals and supply some reference for a relatively full identification of porous media. We advise that low-field NMR can be employed as a lossless analytic method to quantify moveable fluid space fractal theory. (C) 2016 Elsevier Ltd. All rights reserved.

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作者: Wu, JS (Wu, Jinsong); Guo, S (Guo, Song); Li, J (Li, Jie); Zeng, DZ (Zeng, Deze)

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摘要: Big data are widely recognized as being one of the most powerful drivers to promote productivity, improve efficiency, and support innovation. It is highly expected to explore the power of big data and turn big data into big values. To answer the interesting question whether there are inherent correlations between the two tendencies of big data and green challenges, a recent study has investigated the issues on greening the whole life cycle of big data systems. This paper would like to discover the relations between the trend of big data era and that of the new generation green revolution through a comprehensive and panoramic literature survey in big data technologies toward various green objectives and a discussion on relevant challenges and future directions.

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KeyWords Plus: AIR-POLLUTION; ENERGY-CONSUMPTION; WATER-POLLUTION; SYSTEM; MODIS

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标题: Gold mineralization in China: Metallogenic provinces, deposit types and tectonic framework

作者: Deng, J (Deng, Jun); Wang, QF (Wang, Qingfei)

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摘要: We present a review of major gold mineralization events in China and a summary of metallogenic provinces, deposit types, metallogenic epochs and tectonic settings. Over 200 investigated gold deposits are grouped into 16 Au-metallogenic provinces within five tectonic units such as the Central Asian orogenic belt comprising provinces of Northeast China and Tianshan-Altay; North China Craton comprising the northern margin, Jiaodong, and Xiaoqinling; the Qinling-Qilian-Kunlun orogenic belt consisting of the West Qingling, North Qilian, and East Kunlun; the Tibet and Sanjiang orogenic belts consisting of Lhasa, Garze-Litang, Ailaoshan, and Daduhe-Jinpingshan; and the South China block comprising Youjiang basin, Jiangnan orogenic belt, Middle and Lower Yangtze River, and SE coast. The gold deposits are classified as orogenic, Jiaodong-, porphyry-skarn, Carlin-like, and epithermal-types, among which the first three types are dominant.

The orogenic gold deposits formed in various tectonic settings related to oceanic subduction and subsequent crustal extension in the Qinling-Qilian-Kunlun, Tianshan-Altay, northern margin of North China Craton, and Xiaoqinling, and related to the Eocene-Miocene continental collision in the Tibet and Sanjiang orogenic belts. The tectonic periods such as from slab subduction to block amalgamation, from continental soft to hard collision, from intracontinental compression to shearing or extension, are important for the formation of the orogenic gold deposits. The orogenic gold deposits are the products of metamorphic fluids released during regional metamorphism associated with oceanic subduction or continental collision, or related to magma emplacement and associated hydrothermal activity during lithospheric extension after ocean closure. The Jiaodong-type, clustered around Jiaodong, Xiaoqinling, and the northern margin of the North China Craton, is characterized by the involvement of mantle-derived fluids and a temporal link to the remote subduction of the Pacific oceanic plate concomitant with the episodic destruction of North China Craton. The Carlin-like gold metallogenesis is related to the activity of connate fluid, metamorphic fluid, and meteoric water in different degrees in the Youjiang basin and West Qinling; the former Au province is temporally related to the remote subduction of the Tethyan oceanic plate and the later formed in a syn-collision setting. Porphyry-skarn Au deposits are distributed in the Tianshan-Altay, the Middle and Lower Yangtze River region, and Tibet and Sanjiang orogenic belts in both subduction and continental collision settings. The magma for the porphyry-skarn Au deposits commonly formed by melting of a thickened juvenile crust The epithermal Au deposits, dominated by the low-sulfidation type, plus a few high-sulfidation ones, were produced during the Carboniferous oceaic plate subduction in Tianshan-Altay, during Early Cretaceous and Quaternary oceanic plate subduction in SEt coast of South China Block, and during the Pliocene continental collision in Tibet. The available data of different isotopic systems, especially fluid D-O isotopes and carbonate C-O systems, reveal that the isotopic compositions are largely overlapping for different genetic types and different for the same genetic type in different Au belts. The isotopic compositions are thus not good indicators of various genetic types of gold deposit, perhaps due to overprinting of post-ore alteration or the complex evolution of the fluids.

Although gold metallogeny in China was initiated in Cambrian and lasted until Cenozoic, it is mainly concentrated in four main periods. The first is Carboniferous when the Central Asian orogenic belt formed by welding of micro continental blocks and arcs in Tianshan-Altay, generating a series of porphyry-epithermal-orogenic deposits. The second period is from Triassic to Early Jurassic when the current tectonic mainframe of China started to take shape. In central and southern China, the North China Craton, South China Block and Simao block were amalgamated after the closure of Paleo-Tethys Ocean in Triassic, forming orogenic and Carlin-like gold deposits. The third period is Early Cretaceous when the subduction of the Pacific oceanic plate to the east and that of Neo-Tethyan oceanic plate to the west were taking place. The subduction in eastern China produced the Jiaodong-type deposits in the North China Craton, the skarn-type deposits in the northern margin (Middle to lower reaches of Yangtze River) and the epithermal-type deposits in the southeastern margin in the South China Block. The subduction in western China produced the Carlin-like gold deposits in the Youjiang basin and orogenic ones in the Garze-Litang orogenic belt. The Cenozoic is the last major phase, during which southwestern China experienced continental collision, generating orogenic and porphyry-skarn gold deposits in the Tibetan and Sanjiang orogenic belts. Due to the spatial overlap of the second and third periods in a single gold province, the Xiaoqinling, West Qinling, and northern margin of the North China Craton have two or more episodes of gold metallogeny. (C) 2015 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者: Wang, LC (Wang, Lunche); Kisi, O (Kisi, Ozgur); Zounemat-Kermani, M (Zounemat-Kermani, Mohammad); Salazar, GA (Ariel Salazar, German); Zhu, ZM (Zhu, Zhongmin); Gong, W (Gong, Wei)

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摘要: Daily observations of meteorological parameters, air temperature, air pressure, relative humidity, water vapor pressure and sunshine duration hours observed at 12 stations in different climatic zones during 1961-2014 are reported for testing, validating and comparing different solar radiation models. Three types of Artificial Neural Network (ANN)methods, Multilayer Perceptron (MLP), Generalized Regression Neural Network (GRNN) and Radial Basis Neural Network (RBNN) are applied in this study for predicting the daily global solar radiation (Hg) using above meteorological variables as model inputs. The Bristow Campbell model has also been improved by considering the factors influencing the incoming solar radiation, such as relative humidity, cloud cover, etc. The results indicate that there are large differences in model accuracies for each model at different stations, the ANN models can estimate daily Hg with satisfactory accuracy at most stations in different climate zones, and MLP and RBNN models provide better accuracy than the GRNN and IBC models, for example, the MAE and RMSE values range 1.53-2.29 and 1.94-3.27 MJ m(-2) day(-1), respectively for MLP model. The model performances also show some differences at different stations for each model, for example, the RMSE values from MLP model are 1.94 and 3.27 MJ m(-2) day(-1) at NN and HZ stations, respectively. Meanwhile, ANN models underestimate few high radiation values at some stations, which may due to the differences in training and testing data ranges and distributions of the stations. Finally, the differences in model performances from different solar radiation models have been further analyzed. (C) 2016 Elsevier Ltd. All rights reserved.

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KeyWords Plus: REGRESSION NEURAL-NETWORKS; SPATIAL-DISTRIBUTION; EMPIRICAL-MODELS; IRRADIANCE; TEMPERATURE; ALGORITHM; DIFFUSE; SURFACE; TREND

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标题: Organolead Halide Perovskite Nanocrystals: Branched Capping Ligands Control Crystal Size and Stability

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摘要: CH3NH3PbBr3 perovskite nanocrystals (PNCs) of different sizes (ca. 2.5-100 nm) with high photoluminescence (PL) quantum yield (QY; ca. 15-55%) and product yield have been synthesized using the branched molecules, APTES and NH2-POSS, as capping ligands. These ligands are sterically hindered, resulting in a uniform size of PNCs. The different capping effects resulting from branched versus straight-chain capping ligands were compared and a possible mechanism proposed to explain the dissolution-precipitation process, which affects the growth and aggregation of PNCs, and thereby their overall stability. Unlike conventional PNCs capped with straight-chain ligands, APTES-capped PNCs show high stability in protic solvents as a result of the strong steric hindrance and propensity for hydrolysis of APTES, which prevent such molecules from reaching and reacting with the core of PNCs.

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作者关键词: (3-aminopropyl)triethoxysilane (APTES); nanocrystals; nanocrystal stability; organolead halide perovskites; photoluminescence

KeyWords Plus: QUANTUM DOTS; HIGH-PERFORMANCE; TEMPERATURE; PASSIVATION; DYNAMICS; GROWTH

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作者: Deng, Y (Deng, Yong); Li, JH (Li, Jinhong); Qian, TT (Qian, Tingting); Guan, WM (Guan, Weimin); Li, YL (Li, Yali); Yin, XP (Yin, Xiaoping)

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摘要: A series of novel polyethylene glycol-silver nanowire/expanded vermiculite shape-stabilized composite phase change materials (PEG-Ag/EVM ss-CPCMs) were prepared by physical blending and impregnation method to overcome liquid leakage during phase transition and enhance the thermal conductivity of PEG. In these PEG-Ag/EVM ss-CPCMs, PEG served as the phase change material for thermal energy storage; Ag NW served as thermal conductivity enhancement filler; EVM acted as the supporting material to provide structural strength and prevent the leakage of melted PEG. SEM analysis results indicated that Ag NW wrapped with PEG was well dispersed and enwrapped inside the pores and surfaces of EVM due to capillary force and surface tension. It was found that the maximum encapsulation capacity of PEG in all PEG-Ag/EVM ss-CPCMs with good shape stability was 66.1 wt.%. The thermal conductivity of PEG-Ag/EVM ss-CPCMs could be greatly enhanced by the prepared Ag NW with a length of 5-20 mu m and a diameter of 50-100 nm. A theoretical calculation method was developed to predict and evaluate the thermal conductivity enhancement ability of Ag NW. The predictions were consistent with experimental results. The thermal conductivity of PEG-Ag/EVM ss-CPCM19.3 reached 0.68 W/m K, which was 11.3 times higher than that of pure PEG, and corresponding phase change latent heat was 96.4 J/g. The supercooling extent of PEG in PEG-Ag/EVM ss-CPCMs decreased approximate 7 degrees C because the EVM could act as a heterogeneous nucleation center to promote the crystallization of PEG. FT-IR and TGA results showed that the PEG-Ag/EVM ss-CPCMs exhibited excellent chemical compatibility and thermal stability. (C) 2016 Elsevier B.V. All rights reserved.

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作者关键词: Polyethylene glycol; Expanded vermiculite; Phase change material; Silver nanowire; Thermal conductivity enhancement

KeyWords Plus: ACID/EXPANDED PERLITE COMPOSITE; CHANGE MATERIALS PCMS; PARAFFIN/EXPANDED VERMICULITE; MESOPOROUS SILICA; CARBON; RELIABILITY; PERFORMANCE; KAOLINITE; DIATOMITE; BEHAVIOR

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ESI 热点论文: N

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标题: The Challenges and Solutions for Cadmium-contaminated Rice in China: A Critical Review

作者: Hu, YN (Hu, Yuanan); Cheng, HF (Cheng, Hefa); Tao, S (Tao, Shu)

来源出版物: ENVIRONMENT INTERNATIONAL 卷: 92-93 页: 515-532 DOI: 10.1016/j.envint.2016.04.042 出版年: JUL-AUG 2016

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摘要: The wide occurrence of Cd-contaminated rice in southern China poses significant public health risk and deserves immediate action, which arises primarily from extensive metal (including Cd) contamination of paddies with the fast expansion of nonferrous metal mining and smelting activities. Accumulation of Cd in rice grains can be reduced by removing Cd from the contaminated paddy soils, reducing its bioavailability, and controlling its uptake by rice plants. Although a range of measures can be taken to rehabilitate Cd-contaminated lands, including soil replacement and turnover, chemical washing, and phytoremediation, they are either too expensive and/or too slow. Various amendment materials, including lime, animal manures, and biochar, can be used to immobilize Cd in soils, but such fixation approach can only temporarily reduce Cd availability to rice uptake. Cultivation of alternative crops with low Cd accumulation in edible plant parts is impractical on large scales due to extensive contamination and food security concerns in southern China. Transgenic techniques can help develop rice cultivars with low Cd accumulation in grains, but little public acceptance is expected for such products. As an alternative, selection and development of low-Cd rice varieties and hybrids through plant biotechnology and breeding, particularly, by integration of marker-assisted selection (MAS) with traditional breeding, could be a practical and acceptable option that would allow continued rice production in soils with high bioavailability of Cd. Plant biotechnology and breeding can also help develop Cd-hyperaccumulating rice varieties, which can greatly facilitate phytoremediation of contaminated paddies. To eliminate the long-term risk of Cd entering the food chain, soils contaminated by Cd should be cleaned up when cost-effective remediation measures are available. (C) 2016 Elsevier Ltd. All rights reserved.

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语言: English

文献类型: Review

作者关键词: Cadmium-contaminated rice; Dietary intake; Health risk; Phytoavailability; Soil remediation; Plant biotechnology and breeding

KeyWords Plus: POTENTIAL HEALTH-RISK; HEAVY-METAL POLLUTION; ORYZA-SATIVA L.; CD-TAINTED RICE; ORGANIC-MATTER; RENAL DYSFUNCTION; SURFACE SOILS; GRAIN CADMIUM; PADDY SOILS; ZEA-MAYS

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Stability Analysis for Delayed Neural Networks Considering Both Conservativeness and Complexity

作者: Zhang, CK (Zhang, Chuan-Ke); He, Y (He, Yong); Jiang, L (Jiang, Lin); Wu, M (Wu, Min)

来源出版物: IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS 卷: 27 期: 7 页: 1486-1501 DOI: 10.1109/TNNLS.2015.2449898 出版年: JUL 2016

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摘要: This paper investigates delay-dependent stability for continuous neural networks with a time-varying delay. This paper aims at deriving a new stability criterion, considering tradeoff between conservativeness and calculation complexity. A new Lyapunov-Krasovskii functional with simple augmented terms and delay-dependent terms is constructed, and its derivative is estimated by several techniques, including free-weighting matrix and inequality estimation methods. Then, the influence of the techniques used on the conservativeness and the complexity is analyzed one by one. Moreover, useful guidelines for improving criterion and future work are briefly discussed. Finally, the advantages of the proposed criterion compared with the existing ones are verified based on three numerical examples.

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语言: English

文献类型: Article

作者关键词: Calculation complexity; conservativeness; delay-dependent stability; delayed neural networks (DNNs); Lyapunov-Krasovskii functional (LKF)

KeyWords Plus: GLOBAL ASYMPTOTIC STABILITY; LOAD FREQUENCY CONTROL; TIME-VARYING DELAYS; DEPENDENT STABILITY; EXPONENTIAL STABILITY; CRITERIA; SYSTEMS

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输出日期: 2022-01-19

标题: Deep feature weighting for naive Bayes and its application to text classification

作者: Jiang, LX (Jiang, Liangxiao); Li, CQ (Li, Chaoqun); Wang, SS (Wang, Shasha); Zhang, LG (Zhang, Lungan)

来源出版物: ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE 卷: 52 页: 26-39 DOI: 10.1016/j.engappai.2016.02.002 出版年: JUN 2016

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摘要: Naive Bayes (NB) continues to be one of the top 10 data mining algorithms due to its simplicity, efficiency and efficacy. Of numerous proposals to improve the accuracy of naive Bayes by weakening its feature independence assumption, the feature weighting approach has received less attention from researchers. Moreover, to our knowledge, all of the existing feature weighting approaches only incorporate the learned feature weights into the classification of formula of naive Bayes and do not incorporate the learned feature weights into its conditional probability estimates at all. In this paper, we propose a simple, efficient, and effective feature weighting approach, called deep feature weighting (DFW), which estimates the conditional probabilities of naive Bayes by deeply computing feature weighted frequencies from training data. Empirical studies on a collection of 36 benchmark datasets from the UCI repository show that naive Bayes with deep feature weighting rarely degrades the quality of the model compared to standard naive Bayes and, in many cases, improves it dramatically. Besides, we apply the proposed deep feature weighting to some state-of-the-art naive Bayes text classifiers and have achieved remarkable improvements. (C) 2016 Elsevier Ltd. All rights reserved.

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语言: English

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作者关键词: Naive Bayes; Feature weighting; Correlation-based feature selection; Text classification

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输出日期: 2022-01-19

标题: Stability analysis of systems with time-varying delay via relaxed integral inequalities

作者: Zhang, CK (Zhang, Chuan-Ke); He, Y (He, Yong); Jiang, L (Jiang, L.); Wu, M (Wu, Min); Zeng, HB (Zeng, Hong-Bing)

来源出版物: SYSTEMS & CONTROL LETTERS 卷: 92 页: 52-61 DOI: 10.1016/j.sysconle.2016.03.002 出版年: JUN 2016

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摘要: This paper investigates the stability of linear systems with a time-varying delay. The key problem concerned is how to effectively estimate single integral term with time-varying delay information appearing in the derivative of Lyapunov-Krasovskii functional. Two novel integral inequalities are developed in this paper for this estimation task. Compared with the frequently used inequalities based on the combination of Wirtinger-based inequality (or Auxiliary function-based inequality) and reciprocally convex lemma, the proposed ones can provide smaller bounding gap without requiring any extra slack matrix. Four stability criteria are established by applying those inequalities. Based on three numerical examples, the advantages of the proposed inequalities are illustrated through the comparison of maximal admissible delay bounds provided by different criteria. (C) 2016 Elsevier B.V. All rights reserved.

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语言: English

文献类型: Article

作者关键词: Time-delay system; Time-varying delay; Stability; Relaxed integral inequality; Linear matrix inequality

KeyWords Plus: DEPENDENT STABILITY; ROBUST STABILITY; LINEAR-SYSTEMS; CRITERIA; STABILIZATION; FUNCTIONALS

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输出日期: 2022-01-19

标题: The giant Jiaodong gold province: The key to a unified model for orogenic gold deposits?

作者: Groves, DI (Groves, David I.); Santosh, M (Santosh, M.)

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摘要: Although the term orogenic gold deposit has been widely accepted for all gold-only lode-gold deposits, with the exception of Carlin-type deposits and rare intrusion-related gold systems, there has been continuing debate on their genesis. Early syngenetic models and hydrothermal models dominated by meteoric fluids are now clearly unacceptable. Magmatic-hydrothermal models fail to explain the genesis of orogenic gold deposits because of the lack of consistent spatially - associated granitic intrusions and inconsistent temporal relationships. The most plausible, and widely accepted, models involve metamorphic fluids, but the source of these fluids is hotly debated. Sources within deeper segments of the supracrustal successions hosting the deposits, the underlying continental crust, and subducted oceanic lithosphere and its overlying sediment wedge all have their proponents. The orogenic gold deposits of the giant Jiaodong gold province of China, in the delaminated North China Craton, contain ca. 120 Ma gold deposits in Precambrian crust that was metamorphosed over 2000 million years prior to gold mineralization. The only realistic source of fluid and gold is a subducted oceanic slab with its overlying sulfide-rich sedimentary package, or the associated mantle wedge. This could be viewed as an exception to a general metamorphic model where orogenic gold has been derived during greenschist- to amphibolite-facies metamorphism of supracrustal rocks: basaltic rocks in the Precambrian and sedimentary rocks in the Phanerozoic. Alternatively, if a holistic view is taken, Jiaodong can be considered the key orogenic gold province for a unified model in which gold is derived from late-orogenic metamorphic devolatilization of stalled subduction slabs and oceanic sediments throughout Earth history. The latter model satisfies all geological, geochronological, isotopic and geochemical constraints but the precise mechanisms of auriferous fluid release, like many other subduction-related processes, are model-driven and remain uncertain. (C) 2015, China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V.

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摘要: The "Cambrian Explosion" is known for rapid increases in the morphological disparity and taxonomic diversity of metazoans. It has been widely proposed that this biological event was a consequence of oxygenation of the global ocean, but this hypothesis is still under debate. Here, we present high resolution Fe-S-C-Al-trace element geochemical records from the Jinsha (outer shelf) and Weng'an (outer shelf) sections of the early Cambrian Yangtze Platform, integrating these results with previously published data from six correlative sections representing a range of water depths (Xiaotan, Shatan, Dingtai, Yangjiaping, Songtao, and Longbizui). The integrated iron chemistry and redox-sensitive trace element data suggest that euxinic mid-depth waters dynamically coexisted with oxic surface waters and ferruginous deep waters during the earliest Cambrian, but that stepwise expansion of oxic waters commenced during Cambrian Stage 3 (similar to 521-514 Ma). Combined with data from lower Cambrian sections elsewhere, including Oman, Iran and Canada, we infer that the global ocean exhibited a high degree of redox heterogeneity during the early Cambrian, consistent with low atmospheric oxygen levels (similar to 10-40% of present atmospheric level, or PAL). A large spatial gradient in pyrite sulfur isotopic compositions (delta S-34(py)), which vary from a mean of -12.0 parts per thousand in nearshore areas to +22.5 parts per thousand in distal deepwater sections in lower Cambrian marine units of South China imply low concentrations and spatial heterogeneity of seawater sulfate, which is consistent with a limited oceanic sulfate reservoir globally. By comparing our reconstructed redox chemistry with fossil records from the lower Cambrian of South China, we infer that a stepwise oxygenation of shelf and slope environments occurred concurrently with a gradual increase in ecosystem complexity. However, deep waters remained anoxic and ferruginous even as macrozooplankton and suspension-feeding mesozooplankton appeared during Cambrian Stage 3. These findings suggest that the "Cambrian Explosion" in South China may have been primarily a consequence of locally improved oxygenation of the ocean-surface layer rather than of the full global ocean. Our observations are inconsistent with predicted changes in ocean chemistry driven by early Cambrian animals, suggesting that the influence of early Cambrian animals on contemporaneous ocean chemistry, as proposed in previous studies, may be overly exaggerated. (C) 2016 Elsevier B.V. All rights reserved.

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作者: Luo, GM (Luo, Genming); Ono, SH (Ono, Shuhei); Beukes, NJ (Beukes, Nicolas J.); Wang, DT (Wang, David T.); Xie, SC (Xie, Shucheng); Summons, RE (Summons, Roger E.)

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摘要: Molecular oxygen (O-2) is, and has been, a primary driver of biological evolution and shapes the contemporary landscape of Earth's biogeochemical cycles. Although "whiffs" of oxygen have been documented in the Archean atmosphere, substantial O-2 did not accumulate irreversibly until the Early Paleoproterozoic, during what has been termed the Great Oxygenation Event (GOE). The timing of the GOE and the rate at which this oxygenation took place have been poorly constrained until now. We report the transition (that is, from being mass-independent to becoming mass-dependent) in multiple sulfur isotope signals of diagenetic pyrite in a continuous sedimentary sequence in three coeval drill cores in the Transvaal Supergroup, South Africa. These data precisely constrain the GOE to 2.33 billion years ago. The new data suggest that the oxygenation occurred rapidly-within 1 to 10 million years-and was followed by a slower rise in the ocean sulfate inventory. Our data indicate that a climate perturbation predated the GOE, whereas the relationships among GOE, "Snowball Earth" glaciation, and biogeochemical cycling will require further stratigraphic correlation supported with precise chronologies and paleolatitude reconstructions.

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作者: Zuo, RG (Zuo, Renguang); Wang, J (Wang, Jian)

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摘要: Over the past several decades, a wide range of complex structures or phenomena of interest to geologists and geochemists has been quantitatively characterized using fractal/multifractal theory and models. With respect to the application of fractal/multifractal models to geochemical data, the focus has been on how to decompose geochemical populations or quantify the spatial distribution of geochemical data. A variety of fractal/multifractal models for this purpose have been proposed on the basis of the scaling characteristics of geochemical data. These include the concentration-area (C-A) fractal model, concentration-distance (C-D) fractal model, spectrum-area (S-A) multifractal model, multifractal singularity analysis, and the concentration-volume (C-V) fractal model. These fractal models have been widely demonstrated to be useful, as indicated by the increasing number of published papers. In this study, fractal/multifractal modeling of geochemical data including its theory, the way it works, its benefits and limitations, its applications, and the relationships between these models are reviewed. The comparison among of C-A, S-A, and multifractal singularity analysis based on simulated data suggested that mapping singularity technique can enhance and identify weak anomalies caused by buried sources. Future study should focus on how to distinguish the true anomalies associated to mineralization with the false anomalies from a fractal/multifractal perspective. (C) 2015 Elsevier B.V. All rights reserved.

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作者: Zhou, C (Zhou, Chao); Yin, KL (Yin, Kunlong); Cao, Y (Cao, Ying); Ahmed, B (Ahmed, Bayes)

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摘要: The landslide displacement in the Three Gorges Reservoir, China, experiences step-like deformation that is influenced by rainfall and the periodic scheduling of the reservoir. In view of the step-like characteristic, the Particle Swarm Optimization and Support Vector Machine (PSO-SVM) coupling model based on the response of the induced factors was proposed to predict the landslide displacement. The moving, average method was adopted to divide the total displacement into trend term and periodic term. The trend displacement was controlled by the geological conditions and predicted by polynomial function, while the periodic displacement was under the combined control of the triggers and the evolution state of the landslide. Therefore, the PSO-SVM model, based on the factors of the precipitation, the variation range of the reservoir and the displacements of the prior-periods, was proposed to predict the periodic displacement. The typical step-like landslide in the Three Gorges Reservoir, which is known as the Bazimen landslide, was taken as a case study to verify the prediction results. The values of the root mean square error and the mean absolute percentage error were 13.28 and 25.95, respectively. The results showed that rainfall and reservoir water level were the dominant factors for the step-like landslide deformation. The evolution state of the landslide was also significant in reflecting the response relationship between the displacement and inducing factors. In conclusion, the proposed PSO-SVM model can better represent the response relationship between the factors and the periodic displacement, which made the predicted values of the total displacement fit with the measured values greatly. (C) 2016 Elsevier B.V. All rights reserved.

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作者关键词: Step-like landslide; Particle Swarm Optimization (PSO); Support Vector Machine (SVM); Displacement prediction; Three Gorges Reservoir area

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作者: Tang, J (Tang, Jie); Xu, WL (Xu, Wen-Liang); Wang, F (Wang, Feng); Zhao, S (Zhao, Shuo); Wang, W (Wang, Wei)

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摘要: In this paper we present new zircon U-Pb ages, Hf isotope data, and whole-rock major and trace element data for Early Mesozoic intrusive rocks in the Erguna Massif of NE China, and we use these data to constrain the history of southward subduction of the Mongol-Okhotsk oceanic plate, and its influence on NE China as a whole. The zircon U-Pb dating indicates that Early Mesozoic magmatic activity in the Erguna Massif can be subdivided into four stages at similar to 246 Ma, similar to 225 Ma, similar to 205 Ma, and similar to 185 Ma. The similar to 246 Ma intrusive rocks comprise a suite of high-K calc-alkaline diorites, quartz diorites, granodiorites, monzogranites, and syenogranites, with I-type affinities. The similar to 225 Ma intrusive rocks consist of gabbro-diorites and granitoids, and they constitute a bimodal igneous association. The similar to 205 Ma intrusive rocks are dominated by calc-alkaline I-type granitoids that are accompanied by subordinate intermediate-mafic rocks. The similar to 185 Ma intrusive rocks are dominated by I-type granitoids, accompanied by minor amounts of A-types. These Early Mesozoic granitoids mainly originated by partial melting of a depleted and heterogeneous lower crust, whereas the coeval mafic rocks were probably derived from partial melting of a depleted mantle modified by subduction-related fluids. The rock associations and their geochemical features indicate that the similar to 246 Ma, similar to 205 Ma, and similar to 185 Ma intrusive rocks formed in an active continental margin setting related to the southward subduction of the Mongol-Okhotsk oceanic plate. The similar to 225 Ma bimodal igneous rock association formed within an extensional environment in a pause during the subduction process of the Mongol -Okhotsk oceanic plate. Every magmatic stage has its own corresponding set of porphyry deposits in the southeast of the Mongol-Okhotsk suture belt Taking all this into account, we conclude the following: (1) during the Early Mesozoic, the Mongol-Okhotsk oceanic plate was subducted towards the south beneath the Erguna Massif, but with a pause in subduction at similar to 225 Ma; and (2) the southward subduction of the Mongol-Okhotsk oceanic plate not only caused the intense magmatic activity, but was also favorable to the formation of porphyry deposits. (C) 2015 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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KeyWords Plus: U-PB AGES; ASIAN OROGENIC BELT; GREAT XINGAN RANGE; HF ISOTOPIC CHARACTERISTICS; INNER-MONGOLIA; VOLCANIC-ROCKS; NORTH CHINA; LU-HF; TECTONIC EVOLUTION; EASTERN HEILONGJIANG

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作者: Yang, F (Yang, Feng); Ning, ZF (Ning, Zhengfu); Wang, Q (Wang, Qing); Zhang, R (Zhang, Rui); Krooss, BM (Krooss, Bernhard M.)

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摘要: Silurian shale in Sichuan Basin is currently the most important target zone for shale gas exploration and development in China. Pore structure characteristics of Lower Silurian Longmaxi shales from southern Sichuan Basin were investigated. The combination of field emission scanning electron microscope (FE-SEM) and argon ion beam milling was utilized to describe the nanometer-to micrometer-scale (>1.2 nm) pore systems. The shales were characterized by organic geochemical and mineralogical analyses. Total porosity, pore size distribution (PSD), specific surface area, and gas content were determined. Controls of organic matter richness, thermal maturity, and mineralogy on porosity were examined. The contribution of individual mineral components to total porosity was analyzed quantitatively. Total gas contents of the shales determined from canister desorption data were compared with theoretical (sorptive and volumetric) gas storage capacities.

The total organic carbon (TOC) content of the shale samples ranges between 0.1 and 8.0 wt.% and helium porosity varies between 0.7 and 5.7%. Maturity in terms of equivalent vitrinite reflectance of bitumen (R-eqv) ranges from 1.8 to 3.2%. TOC content is a strong control for the pore system of these shales, and shows a positive correlation with porosity. Porosity increases with increasing thermal maturity when R-eqv is less than 2.5%, but decreases for higher thermal maturity samples. FE-SEM reveals four pore types related to the rock matrix that are classified as follows: organic matter (OM)-hosted pores, pores in clay minerals, pores of framework minerals, and intragranular pores in microfossils. Pores in clay minerals are always associated with the framework of clay flakes, and develop around rigid mineral grains because the pressure shadows of mineral grains prevent pores from collapsing. Pores of framework minerals are probably related to dissolution by acidic fluids, and the dissolution-related pores promote porosity of shales. A unimodal PSD exists in the micropore range of TOC-rich samples, while the PSD of carbonate-rich samples are bimodal. A PSD maximum in the micropore range is attributed by OM and another maximum in the range of mesopore-macropores is probably caused by the dissolution of carbonate minerals. Quantitative evaluation of the contribution of individual mineral components to porosity shows that the organic matter contributes approximately 62% to the total porosity. Framework minerals (quartz, feldspar, and carbonates, et al.) and clay minerals contribute 25% and 13%, respectively. The total gas content of these shales ranges from 0.4 to 62 m(3)/t, and the total gas contents of selected samples determined from canister desorption tests agree with the theoretically estimated original gas-in-place (OGIP). OM-hosted pores are the main space for gas storage, and accounted for about 78% (55% adsorbed gas plus 23% free gas) of the OGIP, while pores in the inorganic matter accommodate 22% free gas of the OGIP. (C) 2016 Elsevier B.V. All rights reserved.

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作者: Zhu, DC (Zhu, Di-Cheng); Li, SM (Li, Shi-Min); Cawood, PA (Cawood, Peter A.); Wang, Q (Wang, Qing); Zhao, ZD (Zhao, Zhi-Dan); Liu, SA (Liu, Sheng-Ao); Wang, LQ (Wang, Li-Quan)

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摘要: Integration of lithostratigraphic, magmatic, and metamorphic data from the Lhasa-Qiangtang collision zone in central Tibet (including the Bangong suture zone and adjacent regions of the Lhasa and Qiangtang terranes) indicates assembly through divergent double sided subduction. This collision zone is characterized by the absence of Early Cretaceous high-grade metamorphic rocks and the presence of extensive magmatism with enhanced mantle contributions at ca. 120-110 Ma. Two Jurassic-Cretaceous magmatic arcs are identified from the Caima-Duobuza-Rongma-Kangqiong-Amdo magmatic belt in the western Qiangtang Terrane and from the Along Tso-Yanhu-Daguo-Baingoin-Daru Tso magmatic belt in the northern Lhasa Terrane. These two magmatic arcs reflect northward and southward subduction of the Bangong Ocean lithosphere, respectively. Available multidisciplinary data reconcile that the Bangong Ocean may have closed during the Late Jurassic-Early Cretaceous (most likely ca. 140-130 Ma) through arc-arc "soft" collision rather than continent-continent "hard" collision. Subduction zone retreat associated with convergence beneath the Lhasa Terrane may have driven its rifting and separation from the northern margin of Gondwana leading to its accretion within Asia. (C) 2015 Elsevier B.V. All rights reserved.

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摘要: Magnetic biochar was made from peanut hull biomass using iron chloride in a simplified aqueous phase approach and pyrolysis at alternative peak temperatures (450-650 degrees C). Magnetic biochar showed an extreme capacity for adsorption of hexavalent chromium Cr (VI) from aqueous solution, which was 1-2 orders of magnitude higher compared to standard (non-magnetic) biochar from the same feedstock. Adsorption increased with pyrolysis temperature peaking at 77,542 mg kg(-1) in the sample pyrolysed at 650 degrees C. In contrast to magnetic biochar, the low adsorption capacity of standard biochar decreased with increasing pyrolysis temperature. The fine particle size of magnetic biochar and low aqueous pH were also important for adsorption. Surfaces of products from batch adsorption experiments were characterized by scanning electron microscopy, energy-dispersive X-ray analysis, X-ray diffraction, X-ray photoelectron spectroscopy and vibrating sample magnetometer. This revealed that gamma-Fe2O3 was crucial to the properties (adsorbance and magnetism) of magnetic biochar. The removal mechanism was the Cr (VI) electrostatic attracted on protonated -OH on gamma-Fe2O3 surface and it could be desorbed by alkaline solution. Findings suggest that pyrolysis has potential to create effective, magnetically recoverable adsorbents relevant to environmental application. (C) 2015 Elsevier Ltd. All rights reserved.

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作者: Li, A (Li, Ang); Ding, WL (Ding, Wenlong); He, JH (He, Jianhua); Dai, P (Dai, Peng); Yin, S (Yin, Shuai); Xie, F (Xie, Fei)

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摘要: In order to study pore structure and fractal characteristics of the organic-rich marine shale, fourteen shale samples from Lower Cambrian Qjongzhusi formation in Malong block of eastern Yunnan province were investigated by organic geochemical analysis (total organic carbon content analysis and thermal maturity analysis), X-ray diffraction (XRD) analysis, porosity and permeability tests, field emission scanning electron microscopy (FE-SEM), low-pressure nitrogen adsorption and methane adsorption experiments. Fractal dimensions D-1 and D-2 (at relative pressure of 0-0.5 and 0.5-1, respectively) were obtained from the nitrogen adsorption data using the fractal Frenkel-Halsey-Hill (FHH) method. Not only have the relationships among pore structure parameters of shale, the relationships between TOC content, mineral compositions, pore structure parameters and fractal dimensions been discussed, but also the significance of two fractal dimensions D-1 and D-2 and the impact of fractal dimensions on adsorption capacity have been investigated. The results showed that fourteen shale samples have TOC content ranging from 1.25% to 7.72%, two fractal dimensions both increase with the increasing TOC content, and gradually come to a standstill the curves present the shape of "parabola". The major mineralogical compositions of shales are quartz and clay minerals, the quartz contents are between 25.5% and 42.7%, the clay contents are between 26.6% and 44.2%. Fractal dimension D-1 has a negative correlation with quartz contents and a positive correlation with clay minerals contents, but fractal dimension D2 has no apparent relationship with quartz and clay minerals contents. The specific surface area is in the range of 4.98 m(2)/g-19.66 m(2)/g, the total pore volume is between 0.00479 cm(3)/g and 0.01765 cm(3)/g, and the average pore diameter is between 337 nm and 6.02 nm. Two fractal dimensions increase with the increasing surface area and pore volume, and also increase with the decreasing average pore diameter because of. the complicated pore surface and structure of small pores. Further investigation indicates that D-1 represents fractal characteristics from the irregular pore surface, while D-2 represents fractal characteristics related to the complicated pore structure, and shale samples with larger fractal dimensions have higher methane adsorption capacity. Therefore fractal analysis is helpful to have a better understanding of pore structure and adsorption capacity of marine shale. (C) 2015 Elsevier Ltd. All rights reserved.

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作者: Yang, R (Yang, Rui); He, S (He, Sheng); Yi, JZ (Yi, Jizheng); Hu, QH (Hu, Qinhong)

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摘要: Much attention have been recently paid to the upper Ordovician Wufeng shale (O(3)w) and lower Silurian Longmaxi shale (S(1)l) in the Jiaoshiba area of Sichuan Basin, which is now the largest producing shale gas field in China. Field emission scanning electron microscopy (FE-SEM), low pressure gas (N-2 and CO2) adsorption, helium pycnometry, X-ray diffraction and geochemical analyses were performed to investigate the pore structure and fractal dimension of the pores in O(3)w-S(1)l shale formation in the Jiaoshiba area. FE-SEM images show that organic matter (OM) pores are dominant in the organic-rich samples and these pores are often irregular, bubble-like, elliptical and faveolate in shape, while in organic-poor samples, limited and isolated interparticle (interP), intraparticle (intraP) and OM pores are observed. Reversed S-shaped isotherms obtained from nitrogen adsorption are type II, and hysteresis loops:indicate that the shape of micropore in the samples is slit-or plate-like. BET surface areas and total pore volume vary from 12.2 to 27.1 m(2)/g and from 1.8 x 10(-2) to 2.9 x 10(-2) cm(3)/g, with an average of 19.5 m(2)/g and 2.3 x 10(-2) cm(3)/g, respectively. Adsorption volume from both N-2 and CO2 adsorption increases with respect to TOC contents. Porosities obtained from helium porosimetry are comparable with these from gas (CO2 and N-2) adsorption in O(3)w-S(1)l shale. However, porosity determined by quantitative FE-SEM analysis is much smaller, which is mainly related to limited resolution and the small areas of investigation.

Based on the Frenkel-Halsey-Hill (FHH) model of low-pressure N-2 adsorption, fractal dimensions of the pores varied from 2.737 to 2.823. Relationships between pore structure parameters and TOC content, mineral composition and fractal dimension reveal that the fractal dimension is mainly associated with micropores. Samples with higher TOC content, higher quartz content and lower clay content tend to contain more heterogeneous micropores, resulting in higher fractal dimensions and more complicated pore structure in shales. Therefore, fractal dimension is an effective parameter to reflect the complexity of pore structure and the degree of micropore development in O(3)w-S(1)l shale. (C) 2015 Elsevier Ltd. All rights reserved.

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摘要: The Archean Eon witnessed the production of early continental crust, the emergence of life, and fundamental changes to the atmosphere. The nature of the first continental crust, which was the interface between the surface and deep Earth, has been obscured by the weathering, erosion, and tectonism that followed its formation. We used Ni/Co and Cr/Zn ratios in Archean terrigenous sedimentary rocks and Archean igneous/metaigneous rocks to track the bulk MgO composition of the Archean upper continental crust. This crust evolved from a highly mafic bulk composition before 3.0 billion years ago to a felsic bulk composition by 2.5 billion years ago. This compositional change was attended by a fivefold increase in the mass of the upper continental crust due to addition of granitic rocks, suggesting the onset of global plate tectonics at similar to 3.0 billion years ago.

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标题: Nanoscale pore characteristics of the Lower Cambrian Niutitang Formation. Shale: A case study from Well Yuke #1 in the Southeast of Chongqing, China

作者: Sun, MD (Sun, Mengdi); Yu, BS (Yu, Bingsong); Hu, QH (Hu, Qinhong); Chen, S (Chen, Song); Xia, W (Xia, Wei); Ye, RC (Ye, Ruochen)

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摘要: The Lower Cambrian Niutitang Formation Shale is one of the most important shales being studied for unconventional development in China. In this work, we focused on 21 core samples of Niutitang Shale from Well Yuke #1 in the southeast of Chongqing, to better understand their vertical reservoir characteristics and pore evolution. Using complementary approaches of X-ray diffraction, N-2 and CO2 adsorption, petrology microscope, and field emission-scanning electron microscopy, we conducted a series of analyses for pore volume, pore-size distribution, surface area, fractal characterization, organic geochemistry, petrology, and mineralogy. Results indicate that most micropores (<2 nm) are associated with grains of organic matter. Meanwhile, the meso-macropores (2-50 nm to >50 nm) are composed of organic pores and inorganic pores. Meso-macropore volume per unit of total organic carbon (TOC) content dramatically decreases with an increase of maturity and extent of diagenesis. Meanwhile, the TOC-normalized micropore volume also rapidly declines after maturity (R-0) values were higher than 3.13%. The surface fractal dimension D-1 for relative N-2 pressure P/P-0 > 0.5 with capillary condensation and surface fractal dimension D-2 for P/P-0 < 0.5 with mono- and multi-layer adsorption, derived from N-2 sorption isotherms, can be used to indicate the pore characteristics. D1 is controlled by the percentages of micropore volume. D-2 seems to be affected by the clay mineral contents and thermal maturity. (C) 2015 Elsevier B.V. All rights reserved.

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作者关键词: Lower Cambrian; Shale gas; Reservoir characteristics; Pore structure; Fractal dimension

KeyWords Plus: NORTHEASTERN BRITISH-COLUMBIA; CH4 ADSORPTION CAPACITY; CRETACEOUS GAS SHALES; FRACTAL CHARACTERISTICS; ELECTRON-MICROSCOPY; METHANE ADSORPTION; SICHUAN BASIN; BARNETT SHALE; ALBANY SHALE; POROSITY

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标题: Tectonic architecture and multiple orogeny of the Qinling Orogenic Belt, Central China

作者: Dong, YP (Dong, Yunpeng); Santosh, M (Santosh, M.)

来源出版物: GONDWANA RESEARCH 卷: 29 期: 1 页: 1-40 DOI: 10.1016/j.gr.2015.06.009 出版年: JAN 2016

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摘要: The Qinling Orogenic Belt (QOB) is located between the North China and South China Blocks, and has been considered to have formed by the collision between these blocks. This contribution provides an overview of the composition, nature and ages of the principal tectonic elements including ophiolitic melanges and related volcanic rocks, gabbroic-granitic intrusions, metamorphic basement, sedimentary cover and its provenance in this orogen. The QOB represents a composite orogenic belt that witnessed four major episodes of accretion and collision between discrete continental blocks, such as the North China Block, North Qinling Block and the South China Block. The available geology, geochemistry and geochronology of these tectonic elements together with those of the adjacent regions, can be used to trace the polarity of the four stages of plate subduction, accretion, collision and the related tectonic history as follows. (1) The Grenvillian-aged orogeny along the Kuanping suture between the North Qinling Terrane and North China Block is associated with the southward subduction of Mesoproterozoic Ocean, which led to the amalgamation of the North Qinling Terrane and the North China Block at ca. 1.0 Ga. (2) The Neoproterozoic subduction/accretion as represented by the widely distributed terranes and volcanic-sedimentary rocks, resulted in a wide accretionary wedge formed by the southward accretion to the South China Block. (3) The Paleozoic orogeny along the Shangdan suture between the North and South Qinling Blocks is characterized by Early Paleozoic ocean-continent subduction and a long-lived Late Paleozoic continent-continent subduction. The polarity and detailed evolutionary process of the Early Paleozoic ocean-continent subduction have been constrained by the ophiolitic melange, island-arc related volcanics and intrusions in the North Qinling Belt, as well as the evolutionary history of the Erlangping back-arc basin. The northward subduction and destruction of the Shangdan Ocean during Early Devonian was succeeded by continent-continent subduction beneath the North Qinling Terrane from Middle Devonian to Early Triassic. (4) The Triassic collisional orogeny occurred between the South Qinling Block and South China Block along the Mianlue suture. Silurian rifting along the present Mianlue zone marks the precursor of the eastern Mianlue Ocean, which separated the South Qinling Block from the South China Block during Late Paleozoic. The northward subduction of the ocean led to the Middle Triassic collision between the South China Block and the South Qinling Block. (5) After the collision, the whole QOB evolved into an intra-continental orogen, including Early Jurassic differential tectonics, Late Jurassic to Early Cretaceous compression and thrusting, and Late Cretaceous to Paleogene orogen collapse and depression. These multiple orogenies resulted in abundant mineralization, the genetic types, spatial distribution and metallogenic epochs which correlate well with the tectonics and evolutionary history of the QOB. (C) 2015 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者关键词: Geochemistry; Geochronology; Tectonic evolution; Multiple orogeny; Qinling Orogenic Belt

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标题: Investigation of pore structure and fractal characteristics of the Lower Silurian Longmaxi shales in western Hunan and Hubei Provinces in China

作者: Hu, JG (Hu, Jingang); Tang, SH (Tang, Shuheng); Zhang, SH (Zhang, Songhang)

来源出版物: JOURNAL OF NATURAL GAS SCIENCE AND ENGINEERING 卷: 28 页: 522-535 DOI: 10.1016/j.jngse.2015.12.024 出版年: JAN 2016

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摘要: The pore structure characteristics of the Lower Silurian Longmaxi Formation shales collected from western Hunan and Hubei were investigated using high-pressure mercury injection and low temperature N-2 adsorption/desorption experiments. Total organic carbon values, thermal maturity values and mineralogical compositions were also obtained by relevant experimental methods. The TOC value varies from 0.71% to 4.75%, with a mean value of 2.58%, and their thermal maturities have reached the over-mature stage and dry gas generation window. Quartz and clay minerals are the major mineral compositions in the samples. In contrast to previous studies of other shales (Chalmers and Bustin, 2008; Han et al., 2013; Wang et al., 2013), there are no carbonates in the shale samples of this area. Due to their biogenic source, quartz content is positively correlated with TOC values. Pore size distributions obtained from mercury injection experiments were divided into three groups. Samples with higher TOC content always have smaller dominant pore sizes, and the pore sizes of samples with higher clay mineral content and lower TOC values may be larger, with a major peak between 30 nm and 1 mu m. Through analyzing the N-2 adsorption and desorption isotherms, we found that the morphology of pores in the shales rich in organic matter is narrow neck and wide body, and that of those rich in clay minerals is flat-shaped. BJH and DFT models were used to derive pore size distributions using N-2 adsorption data, and both are representative. The differential distribution curves of pore volumes and surface areas show that all shale samples' dominant pore sizes are within the range of micropores and mesopores, and they are the major contributors to pore surface areas, while mesopores and macropores make more significant contributions to pore volumes. The specific surface area calculated by the BET method ranges from 6.12 to 28.42 m(2)/g, with an average value of 16.14 m(2)/g, and the total pore volume varies from 0.0105 to 0.0338 cm(3)/g, with a mean value of 0.0213 cm(3)/g. The correlational analysis between pore structure parameters and TOC value, quartz and clay mineral content indicates that organic matter and quartz are positively associated with the micropores and fine mesopores, though larger pores can also exist in organic matter, and clay minerals play an important role in mesopores and macropores generation. Due to the infeasibility of using mercury porosimetry data to obtain fractal dimensions, DQ calculated from N-2 adsorption data are used, its value ranges from 2.6353 to 2.7694, with an average value of 2.7284. As we know, the more micropores contained in the shale, the more complex the pore structure will be, and as a result, the fractal dimension will be larger. Therefore, organic matter and quartz positively influence fractal dimension, and there is a negative relationship between clay mineral content and fractal dimension. (C) 2015 Elsevier B.V. All rights reserved.

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作者关键词: Longmaxi Formation shale; Pore structure; Mercury injection; N-2 adsorption; Fractal dimension

KeyWords Plus: NORTHEASTERN BRITISH-COLUMBIA; MISSISSIPPIAN BARNETT SHALE; FORT-WORTH BASIN; CH4 ADSORPTION CAPACITY; GAS-ADSORPTION; SICHUAN BASIN; GEOLOGICAL CONTROLS; ELECTRON-MICROSCOPY; SIZE DISTRIBUTION; GUIZHOU PROVINCE

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标题: Ultrafast ion migration in hybrid perovskite polycrystalline thin films under light and suppression in single crystals

作者: Xing, J (Xing, Jie); Wang, Q (Wang, Qi); Dong, QF (Dong, Qingfeng); Yuan, YB (Yuan, Yongbo); Fanga, YJ (Fanga, Yanjun); Huang, JS (Huang, Jinsong)

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摘要: Understanding the influence of light on ion migration in organic-inorganic halide perovskite (OIHP) materials is important to understand the photostability of perovskite solar cells. We reveal that light could greatly reduce the ion migration energy barrier in both polycrystalline and single crystalline OIHP. The activation energies derived from conductivity measurement under 0.25 Sun decrease to less than one half of the values in the dark. A typical ion drift velocity in CH3NH3PbI3 polycrystalline films is 1.2 mu m s(-1) under 1 Sun, compared with 0.016 mu m s(-1) under 0.02 Sun. Ion migration across the photoactive layers in most OIHP devices thus takes only subseconds under 1 Sun illumination, which is much shorter than what it was thought to take. Most important of all, ion migration through a single crystal surface is still too slow to be observed even after illumination for two days due to the large ion diffusion activation energy, >0.38 eV.

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作者: Yang, LQ (Yang, Li-Qiang); Deng, J (Deng, Jun); Wang, ZL (Wang, Zhong-Liang); Guo, LN (Guo, Lin-Nan); Li, RH (Li, Rui-Hong); Groves, DI (Groves, David I.); Danyushevsky, LV (Danyushevsky, Leonid V.); Zhang, C (Zhang, Chao); Zheng, XL (Zheng, Xiao-Li); Zhao, H (Zhao, Hai)

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摘要: The Xincheng gold deposit, hosted by the Early Cretaceous 132 to 123 Ma Guojialing-type granitoids in northwest Jiaodong Peninsula, southeast North China craton, formed about 2 billion years later than regional metamorphism of the Archean Jiaodong basement rocks. The Xincheng deposit comprises mineralized zones with three types of hydrothermal pyrite associated with gold, tellurides, and a variety of sulfides: py(1) as disseminated euhedral to subhedral grains in altered granitoids around quartz veins; py(2) as subhedral grains with brittle cataclastic textures and fractures in quartz-pyrite veins; and py(3) as subhedral, partially corroded crystals in sulfide-rich veins or veinlets. All three generations of pyrite are unzoned and have low trace element contents, including very low lattice-bound gold contents: (py(1): 0.180 ppm; py(2): 0.053 ppm; py(3): 0.060 ppm). Given that there is 10 to 15% pyrite in the ore zone at Xincheng, its very low gold content indicates that it contributes <0.2% of gold to the 7.75 g/t gold in the orebody. Instead, over 99% of the gold is present as discrete electrum and/or gold (total range 0.02-59% silver) grains, which are largely sited in fractures at all scales in pyrite, other ore minerals, and quartz. Importantly, visible gold in py(3) is also sited on solution-corroded pyrite grains. The pyrite textural and geochemical data indicate that it is impossible to derive the high gold-grade orebodies through local remobilization of originally lattice-hound gold in pyrite. Instead, the gold is interpreted to have been deposited through sulfidation reactions and phase separation of a H2O-CO2 ore fluid during progressive brittle cataclastic deformation associated with seismic activity and regional sinistral transtensional shear movement. This concomitant fluid infiltration and deformation caused episodic deposition and fracturing and corrosion of earlier formed pyrite and deposited visible gold in dilational cracks. The coupled development of the transtensional, rather than normal transpressional setting, and precipitation of gold within dilational veins and wall-rock alteration facilitated the deposition of visible gold and an exceptionally high gold tenor. All deposit characteristics indicate that the Xincheng gold deposit is a member of the epizonal orogenic deposit class.

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标题: A General and Facile Approach to Heterostructured Core/Shell BiVO4/BiOI p-n Junction: Room-Temperature in Situ Assembly and Highly Boosted Visible-Light Photocatalysis

作者: Huang, HW (Huang, Hongwei); He, Y (He, Ying); Du, X (Du, Xin); Chu, PK (Chu, Paul K.); Zhang, YH (Zhang, Yihe)

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摘要: Development of core/shell heterostructures and semiconductor p-n junctions is of great concern for environmental and energy applications. Herein, we develop a facile in situ deposition route for fabrication of a BiVO4/BiOI composite integrating both the core/shell heterostructure and semiconductor p-n junction at room temperature. In the BiVO4/BiOI core/shell heterostructure, the BiOI nanosheets are evenly assembled on the surface of the BiVO4 cores. The photocatalytic performance is evaluated by monitoring the degradation of the dye model Rhodamine B (RhB), colorless contaminant phenol, and photocurrent generation under visible-light irradiation. The heterostructured BiVO4/BiOI core/shell photocatalyst shows drastically enhanced photocatalysis properties compared to the pristine BiVO4 and BiOI. This remarkable enhancement is attributed to the intimate interfacial interactions derived from the core/shell heterostructure and formation of the p-n junction between the p-type BiOI and n-type BiVO4. Separation and transfer of photogenerated electron hole pairs are hence greatly facilitated, thereby resulting in the improved photocatalytic performance as confirmed by electrochemical, photoelectrochemical, radicals trapping, and superoxide radical (center dot O-2(-)) quantification results. Moreover, the core/shell BiVO4/BiOI also displays high photochemical stability. This work sheds new light on the construction of high-performance photocatalysts with core/shell heterostructures and matchable band structures in a simple and efficient way.

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作者: Ma, JY (Ma, Jiayi); Zhou, HB (Zhou, Huabing); Zhao, J (Zhao, Ji); Gao, Y (Gao, Yuan); Jiang, JJ (Jiang, Junjun); Tian, JW (Tian, Jinwen)

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摘要: Feature matching, which refers to establishing reliable correspondence between two sets of features (particularly point features), is a critical prerequisite in feature-based registration. In this paper, we propose a flexible and general algorithm, which is called locally linear transforming (LLT), for both rigid and nonrigid feature matching of remote sensing images. We start by creating a set of putative correspondences based on the feature similarity and then focus on removing outliers from the putative set and estimating the transformation as well. We formulate this as a maximum-likelihood estimation of a Bayesian model with hidden/latent variables indicating whether matches in the putative set are outliers or inliers. To ensure the well-posedness of the problem, we develop a local geometrical constraint that can preserve local structures among neighboring feature points, and it is also robust to a large number of outliers. The problem is solved by using the expectation-maximization algorithm (EM), and the closed-form solutions of both rigid and nonrigid transformations are derived in the maximization step. In the nonrigid case, we model the transformation between images in a reproducing kernel Hilbert space (RKHS), and a sparse approximation is applied to the transformation that reduces themethod computation complexity to linearithmic. Extensive experiments on real remote sensing images demonstrate accurate results of LLT, which outperforms current state-of-the-art methods, particularly in the case of severe outliers (even up to 80%).

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作者: Schoepfer, SD (Schoepfer, Shane D.); Shen, J (Shen, Jun); Wei, HY (Wei, Hengye); Tyson, RV (Tyson, Richard V.); Ingall, E (Ingall, Ellery); Algeo, TJ (Algeo, Thomas J.)

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摘要: Although marine productivity is a key parameter in the global carbon cycle, reliable estimation of productivity in ancient marine systems has proven difficult. In this study, we evaluate the accumulation rates of three commonly used proxies for productivity from a set of primarily Quaternary sediment cores at 94 marine sites, compiled from 37 published sources. For each core, mass accumulation rates were calculated for total organic carbon (TOC), organic phosphorus (P-org), and biogenic barium (Ba-bio). Calculated mass accumulation rates were compared to two independent estimates of modern regional primary productivity and export productivity, as well as to two potential controlling variables, bulk accumulation rate (BAR) and redox environment. BAR was found to exercise a strong control on the preservation of organic carbon. The linear regression equations relating preservation factor to BAR can be transformed to yield equations for primary and export production as a function of TOC and BAR, two variables that can be readily measured or estimated in paleomarine systems. Paleoproductivity can also be estimated from empirical relationships between elemental proxy fluxes and modern productivity rates. Although these equations do not attempt to correct for preservation, organic carbon and phosphorus (but not barium) accumulations rates were found to exhibit a systematic relationship to primary and export production. All of the paleoproductivity equations developed here have a large associated uncertainty and, so, must be regarded as yielding order-of-magnitude estimates.

Relationships between proxy fluxes and BAR provide insights regarding the dominant influences on each elemental proxy. Increasing BAR exerts (1) a strong preservational effect on organic carbon that is substantially larger in oxic facies than in suboxic/anoxic facies, (2) a weak clastic-dilution effect that is observable for organic phosphorus (but not for organic carbon or biogenic barium, owing to other dominant influences on these proxies), and (3) a large negative effect on biogenic barium that is probably due to reduced uptake of barium at the sediment water interface. These effects became evident through analysis of our globally integrated dataset; analysis of individual marine sedimentary units most commonly reveals autocorrelations between elemental proxy fluxes and BAR as a result of the latter being a factor in the calculation of the former. We conclude that organic carbon and phosphorus fluxes have considerable potential as widely useful paleoproductivity proxies, but that the applicability of biogenic barium fluxes may be limited to specific oceanic settings. (C) 2014 Elsevier B.V. All rights reserved.

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标题: Ophiolites in the Xing'an-Inner Mongolia accretionary belt of the CAOB: Implications for two cycles of seafloor spreading and accretionary orogenic events

作者: Song, SG (Song, Shuguang); Wang, MM (Wang, Ming-Ming); Xu, X (Xu, Xin); Wang, C (Wang, Chao); Niu, YL (Niu, Yaoling); Allen, MB (Allen, Mark B.); Su, L (Su, Li)

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摘要: The Xing'an-Inner Mongolia accretionary belt in the southeastern segment of the Central Asian Orogenic Belt (CAOB) was produced by the long-lived subduction and eventual closure of the Paleo-Asian Ocean and by the convergence between the North China Craton and the Mongolian microcontinent. Two ophiolite belts have been recognized: the northern Erenhot-Hegenshan-Xi-Ujimqin ophiolite belt and the southern Solonker-Linxi ophiolite belt. Most basalts in the northern ophiolite belt exhibit characteristics of normal-type to enriched-type mid-ocean ridge basalt affinities with depleted Nd isotopic composition (epsilon(Nd)(t)>+5), comparable to modern Eastern Pacific mid-ocean ridge basalts. Most basaltic rocks in the southern belt show clear geochemical features of suprasubduction zone-type oceanic crust, probably formed in an arc/back-arc environment. The inferred back-arc extension along the Solonker-Linxi belt started at circa 280 Ma. Statistics of all the available age data for the ophiolites indicates two cycles of seafloor spreading/subduction, which gave rise to two main epochs of magmatic activity at 500-410 Ma and 360-220 Ma, respectively, with a gap of similar to 50 million years (Myr). The spatial and temporal distribution of the ophiolites and concurrent igneous rocks favor bilateral subduction toward the two continental margins in the convergence history, with final collision at similar to 230-220 Ma. In the whole belt, signals of continental collision and Himalayan-style mountain building are lacking. We thus conclude that the Xing'an-Inner Mongolia segment of the CAOB experienced two cycles of seafloor subduction, back-arc extension, and final "Appalachian-type" soft collision.

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作者: Zeng, HB (Zeng, Hong-Bing); He, Y (He, Yong); Wu, M (Wu, Min); She, JH (She, Jinhua)

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摘要: The integral inequality technique is widely used to derive delay-dependent conditions, and various integral inequalities have been developed to reduce the conservatism of the conditions derived. In this study, a new integral inequality was devised that is tighter than existing ones. It was used to investigate the stability of linear systems with a discrete distributed delay, and a new stability condition was established. The results can be applied to systems with a delay belonging to an interval, which may be unstable when the delay is small or nonexistent. Three numerical examples demonstrate the effectiveness and the smaller conservatism of the method. (C) 2015 Elsevier Ltd. All rights reserved.

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标题: Free-Matrix-Based Integral Inequality for Stability Analysis of Systems With Time-Varying Delay

作者: Zeng, HB (Zeng, Hong-Bing); He, Y (He, Yong); Wu, M (Wu, Min); She, JH (She, Jinhua)

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摘要: The free-weighting matrix and integral-inequality methods are widely used to derive delay-dependent criteria for the stability analysis of time-varying-delay systems because they avoid both the use of a model transformation and the technique of bounding cross terms. This technical note presents a new integral inequality, called a free-matrix-based integral inequality, that further reduces the conservativeness in those methods. It includes well-known integral inequalities as special cases. Using it to investigate the stability of systems with time-varying delays yields less conservative delay-dependent stability criteria, which are given in terms of linear matrix inequalities. Two numerical examples demonstrate the effectiveness and superiority of the method.

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KeyWords Plus: H-INFINITY CONTROL; ROBUST STABILITY; STABILIZATION; CRITERIA

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作者: Zhu, DC (Zhu, Di-Cheng); Wang, Q (Wang, Qing); Zhao, ZD (Zhao, Zhi-Dan); Chung, SL (Chung, Sun-Lin); Cawood, PA (Cawood, Peter A.); Niu, YL (Niu, Yaoling); Liu, SA (Liu, Sheng-Ao); Wu, FY (Wu, Fu-Yuan); Mo, XX (Mo, Xuan-Xue)

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摘要: New geochronological and geochemical data on magmatic activity from the India-Asia collision zone enables recognition of a distinct magmatic flare-up event that we ascribe to slab breakoff. This tie-point in the collisional record can be used to back-date to the time of initial impingement of the Indian continent with the Asian margin. Continental arc magmatism in southern Tibet during 80-40 Ma migrated from south to north and then back to south with significant mantle input at 70-43 Ma. A pronounced flare up in magmatic intensity (including ignimbrite and mafic rock) at ca. 52-51 Ma corresponds to a sudden decrease in the India-Asia convergence rate. Geological and geochemical data are consistent with mantle input controlled by slab rollback from ca. 70 Ma and slab breakoff at ca. 53 Ma. We propose that the slowdown of the Indian plate at ca. 51 Ma is largely the consequence of slab breakoff of the subducting Neo-Tethyan oceanic lithosphere, rather than the onset of the India-Asia collision as traditionally interpreted, implying that the initial India-Asia collision commenced earlier, likely at ca. 55 Ma.

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作者: Goldfarb, RJ (Goldfarb, Richard J.); Groves, DI (Groves, David I.)

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摘要: Orogenic gold deposits of all ages, from Paleoarchean to Tertiary, show consistency in chemical composition. They are the products of aqueous-carbonic fluids, with typically 5-20 mol% CO2, although unmixing during extreme pressure fluctuation can lead to entrapment of much more CO2-rich fluid inclusions in some cases. Ore fluids are typically characterized by significant concentrations of CH4 and/or N-2, common estimates of 0.01-0.36 mol% H2S, a near-neutral pH of 5.5, and salinities of 3-7 wt% NaCl equiv., with Na > K > > Ca,Mg. This fluid composition consistency favors an ore fluid produced from a single source area and rules out mixing of fluids from multiple sources as significant in orogenic gold formation. Nevertheless, there are broad ranges in more robust fluid-inclusion trapping temperatures and pressures between deposits that support a model where this specific fluid may deposit ore over a broad window of upper to middle crustal depths.

Much of the reported isotopic and noble gas data is inconsistent between deposits, leading to the common equivocal interpretations from studies that have attempted to define fluid and metal source areas for various orogenic gold provinces. Fluid stable isotope values are commonly characterized by the following ranges: (1) delta O-18 for Precambrian ores of + 6 to +11 parts per thousand and for Phanerozoic ores of +7 to +13 parts per thousand; (2) delta D and delta S-34 values that are extremely variable; (3) delta C-13 values that range from -11 to -2 parts per thousand; and (4)delta N-15 of + 10 to + 24 parts per thousand for the Neoarchean, + 6.5 to +12 parts per thousand. for the Paleoproterozoic, and + 1.5 to + 10 parts per thousand for the Phanerozoic. Secular variations in large-scale Earth processes appear to best explain some of the broad ranges in the O, S, and N data. Fluid:rock interaction, particularly in ore trap areas, may cause important local shifts in the O, S, and C ratios. The extreme variations in delta D mainly reflect measurements of hydrogen isotopes by bulk extraction of waters from numerous fluid inclusion generations, many which are not related to ore formation. Radiogenic isotopes, such as those of Pb, Sr, Nd, Sm, and Os, measured on hydrothermal minerals are even more difficult to interpret for defining metal source, particularly as the low-salinity ore fluids transport limited amounts of these elements and significant amounts of these may be locall added to the minerals during alteration reactions at the sites of gold deposition. Noble gas and halogen data are equally equivocal.

Fluid exsolution from granitoids emplaced into the upper and middle crust, metamorphism of the crust, or fluids entering trans-crustal fault zones from below the crust all remain as permissive scenarios associated with orogenic gold formation, as the abundant geochemical data are equivocal. However, geological and geochronological data weigh heavily against a magmatic-hydrothermal model in the upper to middle crust. There is no universal temporal association between orogenic gold and magmatism, and where there is an overlap in age, there is no specific type of magmatism consistently associated with gold formation, nor element zonation around any specific pluton. A crustal metamorphic model for fluid and metal sources is very consistent with geological, geochronological, and geochemical data, although metamorphism on a regional scale that releases these components into major fault zones can be associated with many processes along active continental margins. These can include crustal thickening and radiogenic heating, slab rollback and heating during crustal extension, or subduction of a spreading ridge heating the base of an accretionary prism. In rare examples where Phanerozoic orogenic gold deposits are hosted in Precambrian high-grade metamorphic terranes, fluids and metals must, however, enter a transcrustal fault system from a sub-crustal source. This could either be a devolatilized, subducted, relatively flat, perhaps stalled slab and its overlying sediment, or the corner of the fertilized mantle wedge that releases a fluid during a thermal event. Published by Elsevier B.V.

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作者: Hou, ZQ (Hou, Zengqian); Duan, LF (Duan, Lianfeng); Lu, YJ (Lu, Yongjun); Zheng, YC (Zheng, Yuanchuan); Zhu, DC (Zhu, Dicheng); Yang, ZM (Yang, Zhiming); Yang, ZS (Yang, Zhusen); Wang, BD (Wang, Baodi); Pei, YR (Pei, Yingru); Zhao, ZD (Zhao, Zhidan); McCuaig, TC (McCuaig, T. Campbell)

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摘要: Magmatic-hydrothermal ore deposits in collisional orogens are new targets for modern mineral exploration, yet it is unclear why they preferentially occur in some specific tectonic environments within these orogenic belts. We integrate geologic and geochemical data (especially zircon U-Pb dating and Lu-Hf isotope data) for Mesozoic-Cenozoic magmatic rocks and associated ore deposits in the Lhasa terrane, a highly endowed tectonic unit within the Himalayan-Tibetan orogen, and provide the first example in a continental collision terrane of the application of zircon Hf isotope data to image the lithospheric architecture and its relationship with ore deposits.

Three crustal blocks are identified within the Lhasa terrane by the Hf isotope mapping method. They include a central long-lived Precambrian microcontinent with local reworking and two surrounding juvenile Phanerozoic crustal blocks with significant mantle contributions to constituent magmatic rocks. The three crustal blocks are bounded by two E-W-trending terrane-boundary faults, and each block is cut by two N-S striking concealed faults. Isotopic signatures of zircons from the juvenile crustal blocks indicate that the Phanerozoic continental crust grew from several Mesozoic volcanic-plutonic arcs and by underplating of mantle-derived magmas generated during Mesozoic accretion and Cenozoic collision.

Mesozoic subduction-related porphyry Cu-Au deposits and Cenozoic collision-related Cu-Mo deposits are exclusively located in regions with high exf (>5) juvenile crust. Cu enrichment during differentiation of high foe arc magmas is the key for the formation of Mesozoic subduction-related porphyry Cu-Au. By contrast, remelting of the lower crustal Cu sulfide-rich magmatic cumulates within the juvenile crust is interpreted to have played a key role in the formation of Cenozoic collision-related Cu-Mo deposits.

Granite-related Pb-Zn deposits cluster in the oldest crustal regions or developed along the margin of the old crustal block bounded by lithospheric faults. The porphyry Mo deposits are localized along the reworked margins of the old crustal block. It is suggested that crustal reworking released Mo from the old crust to form porphyry Mo deposits, whereas leaching of Pb and Zn from the Paleozoic carbonate cover strata by felsic intrusion-driven fluids is critical to the formation of Pb-Zn ore deposits.

Skarn Fe-Cu ore deposits are typically localized along a terrane boundary fault, i.e., lithospheric discontinuity, through which crust-derived felsic melt mixed with Cu-rich mantle-derived mafic magmas ascending upward. Associated granitoid rocks usually bear microgranular mafic enclaves and show a zircon Hf isotope array from negative to positive Enf values (-7.3 to +6.7), supporting mixing of juvenile mantle and evolved crustal sources.

The Hf isotope maps show temporal-spatial relationships between crustal structure and the location of ore deposits, demonstrating that the structure, nature, and composition of the crust controlled the localization of ore deposits and the migration of ore-forming metals in the terrane. This study shows that the lithospheric architecture of an orogenic terrane can be imaged by Hf isotope mapping to provide mappable units which can be used to explore for ore deposits at the terrane scale.

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摘要: The North China craton (NCC) hosts numerous gold deposits and is known as the most gold-productive region of China. The gold deposits were mostly formed within a few million years in the Early Cretaceous (130-120 Ma), coeval with widespread occurrences of bimodal magmatism, rift basins and metamorphic core complexes that marked the peak of lithospheric thinning and destruction of the NCC. Stable isotope data and geological evidence indicate that ore-forming fluids and other components were largely exsolved from cooling magma and/or derived from mantle degassing during the period of lithospheric extension. Gold mineralization in the NCC contrasts strikingly with that of other cratons where gold ore-forming fluids were sourced mostly from metamorphic devolatization in compressional or transpressional regimes. In this paper, we present a summary and discussion on time-space distribution and ore genesis of gold deposits in the NCC in the context of the timing, spatial variation, and decratonic processes. Compared with orogenic gold deposits in other cratonic blocks, the Early Cretaceous gold deposits in the NCC are quite distinct in that they were deposited from magma-derived fluids under extensional settings and associated closely with destruction of cratonic lithosphere. We argue that Early Cretaceous gold deposits in the NCC cannot be classified as orogenic gold deposits as previously suggested, rather, they are a new type of gold deposits, termed as "decratonic gold deposits" in this study. The westward subduction of the paleo-West Pacific plate (the Izanagi plate) beneath the eastern China continent gave rise to an optimal tectonic setting for large-scale gold mineralization in the Early Cretaceous. Dehydration of the subducted and stagnant slab in the mantle transition zone led to continuous hydration and considerable metasomatism of the mantle wedge beneath the NCC. As a consequence, the refractory mantle became oxidized and highly enriched in large ion lithophile elements and chalcophile elements (e.g., Cu, Au, Ag and Te). Partial melting of such a mantle would have produced voluminous hydrous, Au- and S-bearing basaltic magma, which, together with crust-derived melts induced by underplating of basaltic magma, served as an important source for ore-forming fluids. It is suggested that the Eocene Carlin-type gold deposits in Nevada, occurring geologically in the deformed western margin of the North America craton, are comparable with the Early Cretaceous gold deposits of the NCC because they share similar tectonic settings and auriferous fluids. The NCC gold deposits are characterized by gold-bearing quartz veins in the Archean amphibolite facies rocks, whereas the Nevada gold deposits are featured by fine-grained sulfide dissemination in Paleozoic marine sedimentary rocks. Their main differences in gold mineralization are the different host rocks, ore-controlling structures, and ore-forming depth. The similar tectonic setting and ore-forming fluid source, however, indicate that the Carlin-type gold deposits in Nevada are actually analogous to decratonic gold deposits in the NCC. Gold deposits in both the NCC and Nevada were formed in a relatively short time interval (< 10 Myr) and become progressively younger toward the subduction zone. Younging of gold mineralization toward subduction zone might have been attributed to retreat of subduction zone and rollback of subducted slab.

According to the ages of gold deposits on inland and marginal zones, the retreat rates of the Izanagi plate in the western Pacific in the Early Cretaceous and the Farallon plate of the eastern Pacific in the Eocene are estimated at 8.8 cm/yr and 3.3 cm/yr, respectively.

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标题: A selective laser melting and solution heat treatment refined Al-12Si alloy with a controllable ultrafine eutectic microstructure and 25% tensile ductility

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摘要: This study shows that a eutectic Al-12Si alloy with controllable ultrafine microstructure and excellent mechanical properties can be achieved by using selective laser melting and subsequent solution heat treatment. This provides a novel and promising approach to the refinement of eutectic Al-Si alloys. Unlike Al-12Si alloys fabricated and refined by traditional methods, the as-fabricated Al-12Si in this study contains nano-sized spherical Si particles surrounding a supersaturated Al matrix. During solution heat treatment, precipitation and coalescence of the Si particles occur, which decreases the Si concentration in the matrix and sub-micron to micron-sized spherical particles embedded in an Al matrix form. The as-fabricated Al-12Si exhibits significantly better tensile properties than the traditionally produced counterparts; while the solution treated Al-12Si has an extremely high ductility of approximately 25%. Importantly, the mechanical properties of the Al-12Si can be tailored through controlling the precipitation and coalescence of the Si particles by varying the solution heat treatment time. A detailed transmission electron microscopy study was conducted to investigate this Al-12Si alloy with ultrafine eutectic microstructure. The excellent tensile properties have been attributed to the refined eutectic microstructure containing spherical Si particles. The formation of this unique microstructure is due to the super heating and an extremely high cooling rate during selective laser melting and the subsequent solution heat treatment, which enables Si to grow along its most stable plane (111)si. Crown Copyright (C) 2015 Published by Elsevier Ltd. on behalf of Acta Materialia Inc. All rights reserved.

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标题: Heterogeneous fenton-like catalytic degradation of 2,4-dichlorophenoxyacetic acid in water with FeS

作者: Chen, H (Chen, Hai); Zhang, ZL (Zhang, Zhonglei); Yang, ZL (Yang, Zhilin); Yang, Q (Yang, Qi); Li, B (Li, Bo); Bai, ZY (Bai, Zhiyong)

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摘要: The degradation of herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) in aqueous solution has been studied by heterogeneous Fenton-like process using synthetic FeS as a catalyst, and the properties of FeS were characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). Several operation parameters including pH, FeS dosage, H2O2 concentration and temperature were investigated and the results showed that 2,4-D was efficiently removed from aqueous solution using FeS as a catalyst over a wide range of pH values from 2.0 to 6.5. At the initial pH of 4.5 (without pH adjustment), 10 mM of H2O2, 10 mg/L of 2,4-D and a FeS dose of 0.5 g/L, 2,4-D was almost completely removed within 300 min and the total organic carbon (TOC) removal could reach 70.4%. The degradation intermediates such as 2,4-dichlorophenol, 2-chlorohydroquinone, 4,6-dichlororesorcinol, 2-chlorobenzoquinone, several short-chain acids and chloride ion have been identified by a gas chromatography mass spectrometry (GC-MS) and an ion chromatography (IC). Based on the findings, a possible reaction pathway was proposed. The results of five consecutive experiments indicated the good stability and reusability of FeS and the scavenging experiments revealed that 2,4-D was mainly decomposed by the attack of HO center dot radicals, especially the surface-bounded HO center dot. (C) 2015 Elsevier B.V. All rights reserved.

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作者关键词: 2,4-Dichlorophenoxyacetic acid; Fenton-like reaction; FeS; Degradation pathway

KeyWords Plus: FE3O4 MAGNETIC NANOPARTICLES; NANOPOROUS ACTIVATED CARBON; HYDROXYL RADICAL GENERATION; REDUCTIVE DECHLORINATION; IRON SULFIDE; AQUEOUS-SOLUTION; HEXAVALENT CHROMIUM; OXIDATION PROCESSES; SURFACE-CHEMISTRY; HYDROGEN-PEROXIDE

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标题: A Graphene-like Oxygenated Carbon Nitride Material for Improved Cycle-Life Lithium/Sulfur Batteries

作者: Liu, JH (Liu, Jinghai); Li, WF (Li, Wanfei); Duan, LM (Duan, Limei); Li, X (Li, Xin); Ji, L (Ji, Lei); Geng, ZB (Geng, Zhibin); Huang, KK (Huang, Keke); Lu, LH (Lu, Luhua); Zhou, LS (Zhou, Lisha); Liu, ZR (Liu, Zongrui); Chen, W (Chen, Wei); Liu, LW (Liu, Liwei); Feng, SH (Feng, Shouhua); Zhang, YG (Zhang, Yuegang)

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摘要: Novel sulfur (5) anchoring materials and the corresponding mechanisms for suppressing capacity fading are urgently needed to advance the performance of Li/S batteries. Here, we designed and synthesized a graphene-like oxygenated carbon nitride (OCN) host material that contains tens of micrometer scaled two-dimensional (2D) rippled sheets, micromesopores, and oxygen heteroatoms. N content can reach as high as 20.49 wt %. A sustainable approach of one-step self-supporting solid-state pyrolysis (OSSP) was developed for the low-cost and large-scale production of OCN. The urea in solid sources not only provides self-supporting atmospheres but also produces graphitic carbon nitride (g-C3N4) working as 2D layered templates. The S/OCN cathode can deliver a high specific capacity of 1407.6 mA h g(-1) at C/20 rate with 84% S utilization and retain improved reversible capacity during long-term cycles at high current density. The increasing micropores, graphitic N, ether, and carboxylic 0 at the large sized OCN sheet favor S utilization and trapping for polysulfides.

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标题: Early Paleozoic and Early Mesozoic intraplate tectonic and magmatic events in the Cathaysia Block, South China

作者: Shu, LS (Shu, Liangshu); Wang, B (Wang, Bo); Cawood, PA (Cawood, Peter A.); Santosh, M (Santosh, M.); Xu, ZQ (Xu, Zhiqin)

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摘要: The geodynamic framework of the South China Craton in the Early Paleozoic and Early Mesozoic has been modeled as developing through either oceanic convergence or intracontinental settings. On the basis of an integrated structural, geochemical, zircon U-Pb and Hf isotopic, and mica Ar-40/Ar-39 geochronologic study we establish that an intracontinental setting is currently the best fit for the available data. Our results suggest that widespread tectonomagmatic activity involving granite emplacement and mylonitic deformation occurred during two distinct stages: similar to 435-415 Ma and similar to 230-210 Ma. The coeval nature of emplacement of the plutons and their ductile deformation is corroborated by the subparallel orientation of the mylonitic foliation along the pluton margins, gneissose foliation in the middle part of pluton, the magmatic foliation within the plutons, and the schistosity in the surrounding metamorphosed country rocks. The 435-415 Ma granitoids exhibit peraluminous, high-K characteristics, and zircons show negative epsilon Hf(t) values (average -6.2, n =66), and Paleoproterozoic two-stage model ages of circa 2.21-1.64 Ga (average 1.84 Ga). The data suggest that the Early Paleozoic plutons were derived from the partial melting of the Paleoproterozoic basement of the Cathaysia Block. The 230-210 Ma granites are potassic and have zircons with Hf(t) values of -2.8 - -8.7 (average 5.4, n =62), corresponding to T-DM2 ages ranging from 2.0 to 1.44 Ga (average 1.64 Ga), suggesting that the Early Mesozoic partial melts in Cathaysia were also derived from basement. The geochemical distinction between the two phases of granites traces continental crustal evolution with time, with the Early Mesozoic crust enriched in potassium, silicon, and aluminum, but deficient in calcium, relative to the Paleozoic crust. Kinematical investigations provide evidence for an early-stage ductile deformation with a doubly vergent thrusting pattern dated at 433 +/- 1 to 428 +/- 1 Ma (Ar-40/Ar-39 furnace step-heating pseudoplateau ages obtained on muscovite and biotite from mylonite and deformed granite) and a late-stage strike-slip movement with sinistral sense of ductile shearing at 232 +/- 1 to 234 +/- 1 Ma (Ar-40/Ar-39 furnace step-heating pseudoplateau ages) along an E-W direction. The geological, geochemical, and isotopic signatures likely reflect far-field effects in response to continental assembly events at these times.

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标题: Anionic Group Self-Doping as a Promising Strategy: Band-Gap Engineering and Multi-Functional Applications of High-Performance CO32--Doped Bi2O2CO3

作者: Huang, HW (Huang, Hongwei); Li, XW (Li, Xiaowei); Wang, JJ (Wang, Jinjian); Dong, F (Dong, Fan); Chu, PK (Chu, Paul K.); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe)

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摘要: We herein demonstrate self-doping of the CO32- anionic group into a wide bandgap semiconductor Bi2O2CO3 realized by a one-pot hydrothermal technique. The photoresponsive range of the self-doped Bi2O2CO3 can be extended from UV to visible light and the band gap can be continuously tuned. Density functional theory (DFT) calculation results demonstrate that the foreign CO32- ions are doped in the caves constructed by the four adjacent CO32- ions and the CO32- self-doping can effectively narrow the band gap of Bi2O2CO3 by lowering the conduction band position and meanwhile generating impurity level. The photocatalytic performance is evaluated by monitoring NO removal from the gas phase, photodegradation of a colorless contaminant (bisphenol A, BPA) in an aqueous solution, and photocurrent generation. In comparison with the pristine Bi2O2CO3 which is not sensitive to visible light, the self-doped Bi2O2CO3 exhibits drastically enhanced visible-light photoreactivity, which is also superior to that of many other well-known photocatalysts such as P25, C3N4, and BiOBr. The highly enhanced photocatalytic performance is attributed to combination of both efficient visible light absorption and separation of photogenerated electron hole pairs. The self-doped Bi2O2CO3 also shows decent photochemical stability, which is of especial importance for its practical applications. This work demonstrates that self-doping with an anionic group enables the band gap engineering and the design of high-performance photocatalysts sensitive to visible light.

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ESI 热点论文: N

输出日期: 2022-01-19

标题: Effects of vegetation on runoff and soil erosion on reclaimed land in an opencast coal-mine dump in a loess area

作者: Zhang, L (Zhang, Ling); Wang, JM (Wang, Jinman); Bai, ZK (Bai, Zhongke); Lv, CJ (Lv, Chunjuan)

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摘要: Vegetation reconstruction on opencast coal-mine dumps is an effective way to reduce runoff and soil erosion and is a key to restoring ecosystems in ecologically sensitive regions. To investigate the effects of vegetation on runoff and erosion, a field experiment involving eight erosion plots was conducted on a dump at the Antaibao opencast coal mine in, Shanxi Province. The plots were divided into two location groups, platforms and slopes. Each plot was planted with a typical vegetation pattern. The volumes of runoff and soil erosion during each rainfall event were recorded during the rainy season. The results showed that plots on the platforms experienced a larger volume of runoff than plots on the slopes, while the slope plots generated a larger value of soil erosion than the platform plots. Vegetation restoration has different impacts on runoff and soil erosion. A plot covered with 1-year-old Robinia pseudoacacia and Hippophae rhamnoides was most effective in terms of soil conservation; the plots covered with 5-year-old mixed legume plants and 5-year-old mixed grass-shrub-arbor forest were most effective overall in preventing both runoff and soil erosion. Over the long term, vegetation can increase soil organic matter, improve soil physical properties and soil anti-erodibility, and reduce runoff and erosion to a safe level. This study provides a theoretical basis and technical support for land reclamation and soil and water conservation in vulnerable ecological mining regions of a loess plateau. (C) 2015 Elsevier B.V. All rights reserved.

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作者关键词: Vegetation; Runoff; Soil erosion; Opencast coal-mine; Dump; Land reclamation

KeyWords Plus: AGGREGATE STABILITY; SEDIMENT LOSS; WATER; RAINFALL; RESTORATION; PLATEAU; REGION; SITE; REDISTRIBUTION; SYSTEMS

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标题: RECENT ADVANCES ON FRACTAL MODELING OF PERMEABILITY FOR FIBROUS POROUS MEDIA

作者: Cai, JC (Cai, Jianchao); Luo, L (Luo, Liang); Ye, R (Ye, Ran); Zeng, XF (Zeng, Xiangfeng); Hu, XY (Hu, Xiangyun)

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摘要: Permeability is an important hydraulic parameter for characterizing heat and mass transfer properties of fibrous porous media. However, it is difficult to be quantitatively predicted due to the complex and irregular pore structure of fibrous porous media. Fractal geometry has been verified to be an effective method for determining the permeability of fibrous porous media. In this study, recent works on the permeability of fibrous porous media by means of fractal geometry are reviewed, the advances for each presented fractal model are analyzed and summarized, parameter equations used in available fractal permeability models are also briefly compared and reviewed. Future work for more generalized permeability model of fibrous porous media need to conducted by considering the special characters of fibrous materials, uniform pore structure parameter model and the influence factor of capillary pressure, electrokinetic phenomena, etc.

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语言: English

文献类型: Article

作者关键词: Fibrous Porous Media; Permeability; Fractal; Modeling

KeyWords Plus: GAS-DIFFUSION LAYER; MEMBRANE FUEL-CELLS; CAPILLARY-PRESSURE; SPONTANEOUS IMBIBITION; SANDSTONE PORES; GEOMETRY MODEL; HEAT-TRANSFER; FIBER MATS; FLOW; DROP

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标题: A genetic linkage between subduction- and collision-related porphyry Cu deposits in continental collision zones

作者: Hou, ZQ (Hou, Zengqian); Yang, ZM (Yang, Zhiming); Lu, YJ (Lu, Yongjun); Kemp, A (Kemp, Anthony); Zheng, YC (Zheng, Yuanchuan); Li, QY (Li, Qiuyun); Tang, JX (Tang, Juxing); Yang, ZS (Yang, Zhusen); Duan, LF (Duan, Lianfeng)

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摘要: The genesis of continental collision-related porphyry Cu deposits (PCDs) remains controversial. The most common hypothesis links their genesis with magmas derived from subduction-modified arc lithosphere. However, it is unclear whether a genetic linkage exists between collision-and subduction-related PCDs. Here, we studied Jurassic subduction-related Cu-Au and Miocene collision-related Cu-Mo porphyry deposits in south Tibet. The Jurassic PCDs occur only in the western segment of the Jurassic arc, which has depleted mantle-like isotopic compositions [e.g., (Sr-87/Sr-86)(i) = 0.7041-0.7048; epsilon(Nd(t)) as high as 7.5, and epsilon(Hf(t)) as high as 18]. By contrast, no Jurassic PCDs have been found in the eastern arc segment, which is isotopically less juvenile [e.g., (Sr-87/Sr-86)(i) = 0.7041-0.7063, epsilon(Nd(t)) < 4.5, and epsilon(Hf(t)) <= 12]. These results imply that incorporation of crustal components during underplating of Jurassic magma induced copper accumulation as sulfides at the base of the eastern Jurassic arc, inhibiting PCD formation at this time. Miocene PCDs are spatially confined to the Jurassic arc, and the giant Miocene PCDs cluster in its eastern segment where no Jurassic PCDs occur. This suggests that the arc segment barren for subduction-related PCDs could be fertile for collision-related PCDs. Miocene ore-forming porphyries have young Hf model ages and Sr-Nd-Hf isotopic compositions overlapping with those of the Jurassic rocks in the eastern segment, whereas contemporaneous barren porphyries outside the Jurassic arc have abundant zircon inheritance and crustlike Sr-Nd-Hf isotopic compositions. These data suggest that remelting of the lower crustal sulfide-bearing Cu-rich Jurassic cumulates, triggered by Cenozoic crustal thickening and/or subsequent slab break-off, led to the formation of giant Miocene PCDs. The spatial overlap and complementary metal endowment between subduction-and collision-related magmas may be used to evaluate the mineral potential for such deposits in other orogenic belts.

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标题: Hidden Attractors and Dynamical Behaviors in an Extended Rikitake System

作者: Wei, ZC (Wei, Zhouchao); Zhang, W (Zhang, Wei); Wang, Z (Wang, Zhen); Yao, MH (Yao, Minghui)

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摘要: In this paper, an extended Rikitake system is studied. Several issues, such as Hopf bifurcation, coexistence of stable equilibria and hidden attractor, and dynamics analysis at infinity are investigated either analytically or numerically. Especially, by a simple linear transformation, the wide range of hidden attractors is noticed, and the Lyapunov exponents diagram is given. The obtained results show that the unstable periodic solution generated by Hopf bifurcation leads to the hidden attractor. The existence of hidden attractors that may render the system's behavior unpredictable not only depends on the value of system parameters but also on the value of initial conditions. The phenomena are important and potentially problematic in engineering applications.

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作者关键词: Hidden attractor; stable equilibrium; bifurcation; Lyapunov exponents

KeyWords Plus: CHAOTIC SYSTEM

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标题: Fabrication of Multiple Heterojunctions with Tunable Visible-Light-Active Photocatalytic Reactivity in BiOBr-BiOl Full-Range Composites Based on Microstructure Modulation and Band Structures

作者: Huang, HW (Huang, Hongwei); Han, X (Han, Xu); Li, XW (Li, Xiaowei); Wang, SC (Wang, Shichao); Chu, PK (Chu, Paul K.); Zhang, YH (Zhang, Yihe)

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作者关键词: BiOBr; BiOI; crystal structure; electronic structure; photocatalytic mechanism

KeyWords Plus: BI2WO6 PHOTOCATALYST; CRYSTAL-STRUCTURE; SOLAR; CL; BR; HETEROSTRUCTURES; NANOSTRUCTURES; PERFORMANCES; MICROSPHERES; IRRADIATION

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标题: Bi2O2(OH)(NO3) as a desirable [Bi2O2](2+) layered photocatalyst: strong intrinsic polarity, rational band structure and {001} active facets co-beneficial for robust photooxidation capability

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摘要: Developing high-performance photocatalytic materials is of huge significance and highly desirable for fulfilling the pressing need in environmental remediation. In this work, we demonstrate the use of bismuth nitrate Bi2O2(OH)(NO3) as an absorbing photocatalyst, which integrates multiple superiorities, like a [Bi2O2](2+) layered configuration, a non-centrosymmetric (NCS) polar structure and highly reactive {001} facets. Bi2O2(OH)(NO3) nanosheets are obtained by a facile one-pot hydrothermal route using Bi(NO3)(3)center dot 5H(2)O as the sole raw material. Photocatalysis assessment revealed that Bi2O2(OH)(NO3) holds an unprecedented photooxidation ability in contaminant decomposition, far out-performing the well-known photocatalysts BiPO4, Bi2O2CO3, BiOCl and P25 (commercial TiO2). Particularly, it displays a universally powerful catalytic activity against various stubborn industrial contaminants and pharmaceuticals, including phenol, bisphenol A, 2,4-dichlorophenol and tetracycline hydrochloride. In-depth experimental and density functional theory (DFT) investigations co-uncovered that the manifold advantages, such as large polarizability and rational band structure, as well as exposed {001} active facets, induced robust generation of strong oxidating superoxide radicals (center dot O-2(-)) in the conduction band and hydroxyl radicals ((OH)-O-center dot) in the valence band, thus enabling Bi2O2(OH)(NO3) to have a powerful and durable photooxidation capability. Bi2O2(OH)(NO3) also presents high photochemical stability. This work not only rendered a highly active and stable photocatalyst for practical applications, but also laid a solid foundation for future initiatives aimed at designing new photoelectronic materials by manipulating multiple advantageous factors.

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KeyWords Plus: HIGHLY EFFICIENT; ANATASE TIO2; DECHLORINATION; ENHANCEMENT; NANOSHEETS; OXIDATION; REDUCTION; PARTICLES

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标题: Recent progress in luminescence tuning of Ce3+ and Eu2+-activated phosphors for pc-WLEDs

作者: Li, GG (Li, Guogang); Tian, Y (Tian, Ying); Zhao, Y (Zhao, Yun); Lin, J (Lin, Jun)

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摘要: Nowadays, phosphor converted white light-emitting diodes (pc-WLEDs) have been widely used in solid-state lighting and display areas due to their superior lifetime, efficiency, and reliability as well as significant reduction in power consumption. Phosphors are indispensable components of pc-WLED devices, and their luminescence properties determine the quality of WLED lighting and displays. In order to further achieve high luminous efficacy, chromatic stability, and color-rending properties in pc-WLEDs, much effort has been focused on improving current pc-WLED phosphors and developing novel pc-WLED phosphors recently. This review article concerns commonly used rare earth ion (Eu2+ and Ce3+) activated inorganic phosphors, highlighting the important effect of spectral tuning via local structural variations on improving the luminescence performance of phosphors. The main spectral tuning strategies are discussed in detail and summarized, including (1) doping level control; (2) cationic substitution; (3) anionic substitution; (4) cationic-anionic substitution; (5) the crystal-site engineering approach; (6) mixing of nanophases.

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KeyWords Plus: RED-EMITTING PHOSPHOR; DIFFERENT CRYSTALLOGRAPHIC SITES; SOLID-SOLUTION PHOSPHORS; CA-ALPHA-SIALON; WHITE-LIGHT; PHOTOLUMINESCENCE PROPERTIES; CRYSTAL-STRUCTURE; 5D-LEVEL ENERGIES; GREEN PHOSPHOR; THIOSILICATE PHOSPHOR

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输出日期: 2022-01-19

标题: Compositional polarity of Triassic granitoids in the Qinling Orogen, China: Implication for termination of the northernmost paleo-Tethys

作者: Li, N (Li, Nuo); Chen, YJ (Chen, Yan-Jing); Santosh, M (Santosh, M.); Pirajno, F (Pirajno, Franco)

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摘要: The Qinling Orogen was formed from the closure of the northernmost paleo-Tethys sea and the tectonic suturing of the Yangtze and North China Cratons. The timing of this collision and the tectonic framework are debated. The widely developed Triassic granitoids in the western Qinling Orogen offer a key to understand the tectonic evolution of this region. Here we compile the geological, geochemical and geochronological data of the Triassic granitoids from the Qingling Orogen and conclude that the granitoids north of the Mian-Lue Suture were emplaced in an active continental margin related to the northward subduction of the Mian-Lue oceanic plate during 248 - 200 Ma. The granitoids can be classified into I- and S-types, with the former constituting the major variety. Northward from the Mian-Lue Fault, an S-type granite belt appears, followed by and locally overlapping with an I-type granite belt. The I-type granite belt can be subdivided into four sub-belts from south to north, with increasing contents of K2O, K2O + Na2O, SiO2, Th and U, and the ratios of K2O/Na2O, Rb/Sr and (Sr-87/Sr-86)(i), but decreasing contents of Na2O, Al2O3, Mg#, and epsilon Hf(t), except for the northernmost belt which occurs in the Huaxiong Block of the North China Craton. This geochemical polarity of I-type granitoids and the zoned distribution of S- and I-types granitoids cannot be explained through continental collision orogeny (including syn- to post-collision), but can be well interpreted by considering the progressive subduction of the northernmost branch of the paleo-Tethys, as represented by the Mian-Lue Ocean. Thus, the termination of the northernmost paleo-Tethys and the onset of the continental collision between the Yangtze and the North China plates are considered to have occurred at about 200 Ma, during the transition from Triassic to Jurassic. Our model is also supported by the available data from other studies and provides a revised framework for the timing and tectonics of assembly of the Yangtze and the North China Cratons. (C) 2013 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者关键词: Compositional polarity; Triassic granitoids; Tectonics; Qinling Orogen; Paleo-Tethys

KeyWords Plus: ZIRCON U-PB; ND ISOTOPIC COMPOSITIONS; ZHAIWA MO-CU; NORTH CHINA; TECTONIC EVOLUTION; SOUTHERN MARGIN; LU-HF; CRATON IMPLICATIONS; TAIHUA COMPLEX; GEOLOGICAL SIGNIFICANCE

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标题: Mesoporous, hierarchical core/shell structured ZnCo2O4/MnO2 nanocone forests for high-performance supercapacitors

作者: Qiu, KW (Qiu, Kangwen); Lu, Y (Lu, Yang); Zhang, DY (Zhang, Deyang); Cheng, JB (Cheng, Jinbing); Yan, L (Yan, Long); Xu, JY (Xu, Jinyou); Liu, XM (Liu, Xianming); Kim, JK (Kim, Jang-Kyo); Luo, YS (Luo, Yongsong)

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摘要: ZnCo2O4/MnO2 nanocone forests with a mesoporous, hierarchical core-shell structure and a large surface area were hydrothermally grown on 3D nickel foam. The supercapacitor electrodes prepared from the unique structure exhibits exceptional specific capacitances of 2339 and 1526 F g(-1) at current densities of 1 and 10 A g(-1), respectively, and long-term capacity retention of similar to 95.9% after 3000 cycles at 2 A and 94.5% after 8000 cycles at 10 A g(-1). These values are proven to be the highest when the capacitances are compared between the current study and similar core/shell-structured metal oxide electrodes taken from the literature. Many synergistic effects are identified to be responsible for the observations: namely, highly conductive 3D Ni foam substrate that totally eliminate binders and conductive additives; high crystalline quality of the ZnCo2O4 core which is directly grown on the conductive current collector, allowing fast electron transport; and the mesoporous MnO2 shell with a huge surface area for fast ion diffusion and intimate electrode/electrolyte contact. In addition, the nanostructured core and shell have redox reactions with anions and cations from the electrolyte, respectively, both of which contribute much to electrochemical charge storage. (C) 2014 Elsevier Ltd. All rights reserved.

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作者关键词: ZnCo2O4/MnO2; Core/shell structure; Nanocone forest; Mesopores; Supercapacitor

KeyWords Plus: NANOWIRE ARRAY; NI FOAM; MANGANESE-DIOXIDE; GRAPHENE; ELECTRODES; GROWTH; OXIDE; NANOSHEETS

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标题: An exotic Mesoarchean microcontinent: The Coorg Block, southern India

作者: Santosh, M (Santosh, M.); Yang, QY (Yang, Qiong-Yan); Shaji, E (Shaji, E.); Tsunogae, T (Tsunogae, T.); Mohan, MR (Mohan, M. Ram); Satyanarayanan, M (Satyanarayanan, M.)

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摘要: Sandwiched between the Dharwar Craton in the north and the Neoarchean-Proterozoic crustal blocks to the south, the Coorg Block in southern India is composed dominantly of a suite of arc magmatic rocks including charnockites, TTG (tonalite-trondhjemite-granodiorite)-related granitoid suite and felsic volcanic tuffs together with minor accreted oceanic remnants along the periphery of the block. Coeval mafic and felsic magmatism with magma mixing and mingling in an arc setting is well represented in the block. Here we present the petrology, geochemistry, zircon U-Pb geochronology and Lu-Hf isotopes of all the major lithologies from this block. Computation of metamorphic P-T conditions from mineral chemical data shows consistent granulite-facies P-T conditions of 820-870 degrees C and up to 6 kbar. Our geochemical data from major, trace and REE on representative samples of the dominant rock types from the Coorg Block corroborate an arc-related signature, with magma generation in a convergent margin setting. The zircon data yield weighted mean (207)pb/Pb-206 ages of 3153.4 +/- 9 to 3184.0 +/- 55 Ma for syenogranites, 31703 +/- 6.8 Ma for biotite granite, 3275 +/- 5.1 Ma for trondhjemite, 3133 +/- 12 to 3163.8 +/- 6.9 Ma for chamockites, 3156 +/- 10 to 3158.3 +/- 82 for mafic enclaves, 3161 +/- 16 Ma for diorite and 3173 16 Ma for felsic volcanic tuff. An upper intercept age of 3363 +/- 59 Ma and a lower intercept age of 2896 +/- 130 Ma on zircons from a charnockite, as well as an evaluation of the Th/U values of the zircon domains against respective Pb-207/Pb-206 ages suggest that the Mesoarchean magma emplacement which probably ranged from >33 to 3.1 Ga was immediately followed by metamorphism at ca. 3.0 to 2.9 Ga. The ages of magmatic zircons from the chamockites and their mafic granulite enclaves, as well as those from the volcanic tuff and biotite granite, are all remarkably consistent and concordant marking ca. 3.1 Ga as the peak of subduction-related crust building in this block, within the tectonic milieu of an active convergent margin. The majority of zircons from the Coorg rocks show Hf isotope features typical of crystallization from magmas derived from juvenile sources. Their Hf crustal model ages suggest that the crust building might have also involved partial recycling of basement rocks as old as ca. 3.8 Ga. The crustal blocks in the Southern Granulite Terrane in India preserve strong imprints of major tectonothermal events at 25 Ga, 2.0 Ga, 0.8 Ga and 0.55 Ga associated with various subduction-accretion-collision or rifting events. However, the Coorg Block is exceptional with our data suggesting that none of the above events affected this block. Importantly, there is also no record in the Coorg Block for the 2.5 Ga pervasive regional metamorphism that affected all the other blocks in this region. The geochronological data raise the intriguing possibility that this block is an exotic entity within the dominantly Neoarchean collage in the northern domain of the Southern Granulite Terrane of India. The Mesoarchean arc-related rocks in the Coorg Block suggest that the magma factories and their tectonic architecture in the Early Earth were not markedly different from those associated with the modern-style plate tectonics. (C) 2013 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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标题: Mediator-free direct Z-scheme photocatalytic system: BiVO4/g-C3N4 organic-inorganic hybrid photocatalyst with highly efficient visible-light-induced photocatalytic activity

作者: Tian, N (Tian, Na); Huang, HW (Huang, Hongwei); He, Y (He, Ying); Guo, YX (Guo, Yuxi); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe)

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摘要: We disclose the fabrication of a mediator-free direct Z-scheme photocatalyst system BiVO4/g-C3N4 using a mixed-calcination method based on the more reliable interfacial interaction. The facet coupling occurred between the g-C3N4 (002) and BiVO4 (121), and it was revealed by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS) and transmission electron microscope (TEM). The crystal structure and optical properties of the as-prepared samples have also been characterized by Fourier-transform infrared (FTIR), scanning electron microscopy (SEM) and UV-vis diffuse reflectance spectra (DRS) in details. The photocatalytic experiments indicated that the BiVO4/g-C3N4 composite photocatalysts display a significantly enhanced photocatalytic activity pertaining to RhB degradation and photocurrent generation (PC) compared to the pristine BiVO4 and g-C3N4. This remarkably improved photocatalytic performance should be attributed to the fabrication of a direct Z-scheme system of BiVO4/g-C3N4, which can result in a more efficient separation of photoinduced charge carriers than band-band transfer, thus endowing it with the much more powerful oxidation and reduction capability, as confirmed by the photoluminescence (PL) spectra and electrochemical impedance spectra (EIS). The Z-scheme mechanism of BiVO4/g-C3N4 heterostructure was verified by a series of combined techniques, including the active species trapping experiments, NBT transformation and terephthalic acid photoluminescence probing technique (TA-PL) over BiVO4/g-C3N4 composites and the pristine samples. The present work not only furthered the understanding of mediator-free Z-scheme photocatalysis, but also shed new light on the design of heterostructural photocatalysts with high-performance.

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作者: Li, CF (Li, Chun-Feng); Xu, X (Xu, Xing); Lin, J (Lin, Jian); Sun, Z (Sun, Zhen); Zhu, J (Zhu, Jian); Yao, YJ (Yao, Yongjian); Zhao, XX (Zhao, Xixi); Liu, QS (Liu, Qingsong); Kulhanek, DK (Kulhanek, Denise K.); Wang, J (Wang, Jian); Song, TR (Song, Taoran); Zhao, JF (Zhao, Junfeng); Qiu, N (Qiu, Ning); Guan, YX (Guan, Yongxian); Zhou, ZY (Zhou, Zhiyuan); Williams, T (Williams, Trevor); Bao, R (Bao, Rui); Briais, A (Briais, Anne); Brown, EA (Brown, Elizabeth A.); Chen, YF (Chen, Yifeng); Clift, PD (Clift, Peter D.); Colwell, FS (Colwell, Frederick S.); Dadd, KA (Dadd, Kelsie A.); Ding, WW (Ding, Weiwei); Almeida, IH (Almeida, Ivan Hernandez); Huang, XL (Huang, Xiao-Long); Hyun, SM (Hyun, Sangmin); Jiang, T (Jiang, Tao); Koppers, AAP (Koppers, Anthony A. P.); Li, QY (Li, Qianyu); Liu, CL (Liu, Chuanlian); Liu, ZF (Liu, Zhifei); Nagai, RH (Nagai, Renata H.); Peleo-Alampay, A (Peleo-Alampay, Alyssa); Su, X (Su, Xin); Tejada, MLG (Tejada, Maria Luisa G.); Trinh, HS (Hai Son Trinh); Yeh, YC (Yeh, Yi-Ching); Zhang, CL (Zhang, Chuanlun); Zhang, F (Zhang, Fan); Zhang, GL (Zhang, Guo-Liang)

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摘要: Combined analyses of deep tow magnetic anomalies and International Ocean Discovery Program Expedition 349 cores show that initial seafloor spreading started around 33 Ma in the northeastern South China Sea (SCS), but varied slightly by 1-2 Myr along the northern continent-ocean boundary (COB). A southward ridge jump of approximate to 20 km occurred around 23.6 Ma in the East Subbasin; this timing also slightly varied along the ridge and was coeval to the onset of seafloor spreading in the Southwest Subbasin, which propagated for about 400 km southwestward from approximate to 23.6 to approximate to 21.5 Ma. The terminal age of seafloor spreading is approximate to 15 Ma in the East Subbasin and approximate to 16 Ma in the Southwest Subbasin. The full spreading rate in the East Subbasin varied largely from approximate to 20 to approximate to 80 km/Myr, but mostly decreased with time except for the period between approximate to 26.0 Ma and the ridge jump (approximate to 23.6 Ma), within which the rate was the fastest at approximate to 70 km/Myr on average. The spreading rates are not correlated, in most cases, to magnetic anomaly amplitudes that reflect basement magnetization contrasts. Shipboard magnetic measurements reveal at least one magnetic reversal in the top 100 m of basaltic layers, in addition to large vertical intensity variations. These complexities are caused by late-stage lava flows that are magnetized in a different polarity from the primary basaltic layer emplaced during the main phase of crustal accretion. Deep tow magnetic modeling also reveals this smearing in basement magnetizations by incorporating a contamination coefficient of 0.5, which partly alleviates the problem of assuming a magnetic blocking model of constant thickness and uniform magnetization. The primary contribution to magnetic anomalies of the SCS is not in the top 100 m of the igneous basement.

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标题: Cenozoic tectono-magmatic and metallogenic processes in the Sanjiang region, southwestern China

作者: Deng, J (Deng, Jun); Wang, QF (Wang, Qingfei); Li, GJ (Li, Gongjian); Santosh, M (Santosh, M.)

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摘要: The Sanjiang region in SE Tibet Plateau, and the western Yunnan region in southwestern China constitute a collage of Gondwana-derived micro-continental blocks and arc terranes that were accreted together after the closure of the Paleotethys Oceans in Permo-Triassic. The lithospheric structure in Sanjiang prior to the Cenozoic was dominantly characterized by sub-parallel sutures, subduction-modified mantle and crust, Mesozoic basins between the sutures, and primary polymetallic accumulations. During the Cenozoic, intense deformation, episodic magmatism, and diverse mineralization occurred, jointly controlled by the underthrust of South China litho-sphere and the subduction of Pacific plate to the east, the India-Eurasia continental collision and the subduction of Indian oceanic plate to the west. In this paper, we identify the following four main phases for the Cenozoic evolution in the Sanjiang region. (i) Subduction and rollback of Neotethyan oceanic plate before ca. 45-40 Ma caused lithosphere shortening, indicated by folding-thrusting in the shallow crust and horizontal shearing in middle crust, and multiple magmatic activities, with associated formation of Sn ore deposits in the Tengchong block, Cu polymetallic ore deposits within Mesozoic basins, and Mo and Pb-Zn ore deposits in the Cangyuan area nearby the Changning-Menglian suture. (ii) Breakoff of Neotethyan slab in 45-40 Ma in combination with the India-Eurasia continental hard collision caused the diachronous removal of the lower lithospheric mantle during 42-32 Ma, with the resultant potassic-ultrapotassic magmatism and formation of the related porphyry-skarn ore deposits along the Jinshajiang-Ailaoshan suture. (iii) Underthrusting of the South China plate resulting in the kinking of Sanjiang, expressed by block rotation, extrusion, and shearing in the southern Sanjiang during 32-10 Ma, with contemporary formation of the orogenic gold deposit along shear zones and the MVT Pb-Zn ore deposits within Mesozoic basins. (iv) Subduction of Indian oceanic plate possibly together with the Ninety East Ridge caused the local extension and volcanism in western Sanjiang, and the interplay between India-Eurasia collision and the Pacific plate subduction induced tensile stress and mantle perturbation in eastern Sanjiang from ca. 10 Ma to present. The Cenozoic tectonic process traces a continuum of lithosphere shortening, sub-lithosphere mantle removal, and lithosphere underthrusting. During the lithospheric mantle removal, the simultaneous melting of the metasomatized lithospheric mantle and juvenile lower crust with possible metal enrichment contributed to the formation of potassic-ultrapotassic intrusive rocks and related porphyry-skarn mineralization. It is proposed that the kinking in the Sanjiang region was controlled by the non-coaxial compressions of the South China block and India continent, which are much larger in size than the blocks in Sanjiang. The underthrust continental lithosphere of the South China block caused the formation of orogenic gold deposits due to the release of metamorphic fluids from the front of the underthrust zone and the development of MVT Pb-Zn deposits via fluid circulation in the farther metal-enriched Mesozoic basins. Our study reveals that the pre-Cenozoic lithospheric structure in Sanjiang played an important role in the styles of tectonic movement, the nature and spatial distribution of magmatism, and the large-scale metallogeny during the Cenozoic. (C) 2014 Elsevier B.V. All rights reserved.

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摘要: This paper reports the finding of a four-dimensional (4D) non-Sil'nikov autonomous system with three quadratic nonlinearities, which exhibits some behavior previously unobserved: hidden hyperchaotic attractors with only one stable equilibrium. The algebraical form of the non-Sil'nikov chaotic attractor is very similar to the hyperchaotic Lorenz-Stenflo system but they are different and, in fact, nonequivalent in topological structures. Of particular interest is the fact this system has only one stable equilibrium, but can exhibit hidden hyperchaos, chaos, periodic orbit. Moreover, the coexistence of attracting sets can be obtained in the system for some parameter values and different initial conditions, such as hyperchaotic attractor and point, hyperchaotic attractor and period orbit. To further analyze the new system, the ultimate bound and positively invariant set for the modified hyperchaotic Lorenz-Stenflo system are also obtained. Moreover, the complete mathematical characterizations for 4D Hopf bifurcation are rigorously derived and studied.

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作者: Deng, J (Deng, Jun); Wang, QF (Wang, Qingfei); Li, GJ (Li, Gongjian); Li, CS (Li, Chusi); Wang, CM (Wang, Changming)

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摘要: The Sanjiang region in SE Tibet Plateau and NW Yunnan is known to have formed by amalgamation of Gondwana-derived continental blocks and arc terranes as a result of oceanic subduction followed by continental collision from Paleozoic to Mesozoic. In this paper we provide a synthesis of tectonic evolution, magmatism and metallogeny in the region based on data from literatures. Early Paleozoic ophiolites (473-439 Ma) in the Changning-Menglian belt indicate the existence of a Proto-Tethys ocean in this region. Two episodes of subduction-related magmatism in the early-Paleozoic, one occurred in the Baoshan and Tengchong blocks at 502-455 Ma and the other occurred in the Simao block at 421-401 Ma, are regarded as evidence for two different events of subduction of the Proto-Tethys ocean at different locations. The Proto-Tethys was succeeded in early-Devonian by the Paleo-Tethys which comprised the main ocean and three branches: Ailaoshan, Jinshajiang and Garze-Litang. The Changning-Menglian main ocean existed from middle-Devonian to middle-Triassic. The remnants of the oceanic crust are preserved in a few places in the Longmu Tso-Shuanghu suture as well as in the Changning-Menglian ophiolite belt. The eastward subduction of the main oceanic plate from early-Permian to early-Triassic formed a prominent arc terrane stretching > 1500 km from Yunnan to eastern Tibet. From the waning stage of subduction to post-subduction, numerous S-type granite plutons with ages varying between 230 and 219 Ma, such as the Lincang batholith in Yunnan were emplaced at or close to the suture. This event produced several hydrothermal W-Sn deposits in the region. The tectonic evolution and associated magmatism of the Jinshajiang and Ailaoshan branch oceans are generally comparable to those of the main ocean. However, the branch oceans were subducted westward instead. The Garze-Litang branch ocean also underwent westward subduction from middle-Devonian to late-Triassic. Arc-related high Sr/Y porphyry intrusions and associated porphyry-skarn Cu-Mo-Au deposits are common in the Jinshajiang-Ailaoshan region, especially in the Yidun arc which formed prior to Jurassic. The VMS deposits in the Sanjiang region formed in diverse tectonic settings including middle-Silurian back-arc basins, Carboniferous oceanic islands, Paleozoic subduction zones and Triassic post-subduction rifting environments. The Mesozoic and early-Cenozoic evolution of the Baoshan and Tengchong blocks was largely influenced by eastward oceanic subduction of the Meso- and Neo-Tethys from late-Permian to middle-Cretaceous and from late-Cretaceous to similar to 50 Ma, respectively. Abundant early-Cretaceous granitoids and associated skarn-type Pb-Zn and Sn-Fe deposits in the Baoshan and Tengchong blocks were produced in the background of the Shan boundary oceanic slab subduction to the west and the break-off of the Nujiang-Bitu oceanic slab to the north. The subduction of the Neo-Tethys oceanic plate beneath the Tengchong block from Late Cretaceous to Paleogene formed abundant S-type granitoids and many skarn-type and greisen-type Sn-W deposits. Granitoids formed at 105 to 81 Ma and contemporaneous hydrothermal W, Mo, Ag and Au deposits, which temporally coincided with the subduction of the Neo-Tethys, are common in the Yidun arc terrane. (C) 2013 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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标题: Shale gas potential of the major marine shale formations in the Upper Yangtze Platform, South China, Part II: Methane sorption capacity

作者: Tan, JQ (Tan, Jingqiang); Weniger, P (Weniger, Philipp); Krooss, B (Krooss, Bernhard); Merkel, A (Merkel, Alexej); Horsfield, B (Horsfield, Brian); Zhang, JC (Zhang, Jinchuan); Boreham, CJ (Boreham, Christopher J.); van Graas, G (van Graas, Ger); Tocher, BA (Tocher, Bruce Alastair)

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摘要: The marine black shale formations on the Upper Yangtze Platform (UYP), South China are exploration targets for shale gas. Here, we report on the methane sorption capacity of thermally overmature samples from the Lower Silurian and Lower Cambrian black shale intervals in the UYP (UYP-samples). Two immature shale samples from the Middle Cambrian formation in the Georgina Basin, North Australia (AU samples) were also tested to investigate the effect of thermal maturity on sorption isotherms. Excess sorption isotherms were performed over a pressure range of 0-25 MPa at 46 degrees C. The effects of TOC content, thermal maturity, clay minerals, moisture content, pore properties, particle size, temperature, and pressure on methane sorption capacity were analysed. In addition, thermovaporisation gas chromatography (Tvap-GC) was used to measure the residual gas that is stored in the samples under atmospheric pressure and temperature conditions.

The results indicate that the maximum methane excess sorption of the Lower Silurian samples is between 0.045 and 0.064 mmol/g rock and that of Lower Cambrian samples is between 0.036 and 0.210 mmol/g rock. The Langmuir sorption capacity of the Lower Silurian samples ranges from 0.096 to 0.115 mmol/g rock, whereas that of the Lower Cambrian shale ranges from 0.077 to 0.310 mmol/g rock. These results are close to the sorption capacities of the Barnett (U.S.), Devonian-Mississippian ( Western Canada), and Alum ( Southern Scandinavia) shale samples. The shape of the sorption isotherms and methane sorption capacity vary from sample to sample. Under the measured pressure range, the isotherms of the selected immature AU Cambrian samples increase monotonously with pressure, whereas the overmature UYP samples exhibit maxima. The methane sorption capacity of the measured samples positively correlates with TOC content and exhibits a distinct linear relation. The TOC-normalised sorption capacity shows a positive correlation with thermal maturity; however, the corresponding pressure of maximum excess sorption and Langmuir pressure decrease substantially with increasing thermal maturity. The clay minerals show a positive effect on the TOC-normalised sorption capacity. The sorption capacity of clay minerals, however, should have been reduced by the moisture content. The two Lower Cambrian samples that have similar maturities were measured for porosity and pore-size distribution. The sample with a high TOC content shows a high total cumulative pore volume, surface area, total porosity and thus a higher sorption capacity than the sample with less TOC. In addition, larger-sized particles show slightly less sorption capacity than smaller-sized particles. The Tvap-GC results show that the residual gas content of core samples is evidently higher than that of the outcrop samples, which implies a remarkably negative effect of the weathering process. (C) 2014 Elsevier Ltd. All rights reserved.

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作者关键词: Methane sorption capacity; Shale gas; Lower Cambrian shale; Lower Silurian shale; South China

KeyWords Plus: NORTHEASTERN BRITISH-COLUMBIA; PORE STRUCTURE; CARBON-DIOXIDE; TRANSPORT-PROPERTIES; GEOLOGICAL CONTROLS; SICHUAN BASIN; BOWEN BASIN; ADSORPTION; COAL; PRESSURE

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作者: Chen, DM (Chen, Daimei); Wang, ZH (Wang, Zhihong); Ren, TZ (Ren, Tiezhen); Ding, H (Ding, Hao); Yao, WQ (Yao, Wenqing); Zong, RL (Zong, Ruilong); Zhu, YF (Zhu, Yongfa)

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摘要: The influence of defects on the photoactivity of ZnO has been revealed. The defects can be formed via ball-milling treatment, and part of the defects can be repaired via annealing treatment. The photocatalytic activity of the ZnO sharply decreased as the ball-milling speed and milling time increased. After the annealing treatment, the photocatalytic activity recovered partly but could not return to the activity of the pristine ZnO. The bulk defects such as oxygen vacancies (V-O), zinc vacancies (V-Zn) and a lot of nonradiative defects were formed after the milling treatment. The annealing treatment can only repair part of the bulk defects and nonradiative defects. Thus, only part of the photoactivity was recovered. The species trapping experiments showed that the introduction of the bulk defects did not change the photocatalytic mechanism. The main oxidative species for the pristine ZnO, the milled ZnO, and the annealed ZnO are photogenerated holes and hydroxyl radicals.

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KeyWords Plus: VISIBLE-LIGHT; ZINC-OXIDE; OXYGEN VACANCIES; CHARGE-TRANSFER; THIN-FILMS; TIO2; PHOTOLUMINESCENCE; RAMAN; LUMINESCENCE; ENHANCEMENT

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标题: Ce and F Comodification on the Crystal Structure and Enhanced Photocatalytic Activity of Bi2WO6 Photocatalyst under Visible Light Irradiation

作者: Huang, HW (Huang, Hongwei); Liu, K (Liu, Kun); Chen, K (Chen, Kai); Zhang, YL (Zhang, Yinglei); Zhang, YH (Zhang, Yihe); Wang, SC (Wang, Shichao)

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摘要: The novel Ce and F codoped Bi2WO6 samples have been successfully obtained by a facile one-step hydrothermal reaction for the first time. They were characterized by X-ray diffraction patterns (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), high-resolution TEM (HRTEM), X-ray photoelectron spectroscopy (XPS), and UV-vis diffuse reflectance spectra (DRS) and photoluminescence (PL) spectra. The presence of Ce3+, Ce4+, and F- dopants in Bi2WO6 was confirmed by XPS. The change of microstructure and optical band gap has also been observed after the doping of Ce and F. Under visible light, the as-synthesized plate-like F-Ce-Bi2WO6 sample exhibits a much better visible-light-responsive photocatalytic performance than pure Bi2WO6 for the degradation of RhB and photocurrent (PC) generation. The mechanism of high photcatalytic activity was also suggested on the basis of the PL spectra, electrochemical impedance spectra (EIS), and active species trapping measurements. The results indicated that the synergistic effect of the Ce and F dopants is responsible for the efficient separation and migration of photoinduced charge carriers, thus resulting in the remarkably improved photocatalytic activity.

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标题: Compositions of chromite, associated minerals, and parental magmas of podiform chromite deposits: The role of slab contamination of asthenospheric melts in suprasubduction zone environments

作者: Zhou, MF (Zhou, Mei-Fu); Robinson, PT (Robinson, Paul T.); Su, BX (Su, Ben-Xun); Gao, JF (Gao, Jian-Feng); Li, JW (Li, Jian-Wei); Yang, JS (Yang, Jing-Sui); Malpas, J (Malpas, John)

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摘要: Podiform chromitites in the mantle sections of ophiolites belong to either high-Cr (metallurgical) or high-Al (refractory) varieties. Their highly variable compositions are reflected by different Cr#s [100Cr / (Cr + Al)] and Cr203 and Al2O3 contents of the chromite, falling in the boninitic and MORB fields, respectively. Parental magmas of high-Cr chromitites have higher Sc, Mn, Co and Ni, and lower Ti, V, Zn and Ga concentrations than MORB melts; their trace-element patterns are similar to those of boninites, except for Ni and Zn. In contrast, high-Al chromitites have parental magmas characterized by generally flat MORB-normalized patterns, showing slight enrichments in V, Mn and Co, and depletion in Ni and Zn. Regardless of their compositions, both types of chromitites have chondrite-normalized platinum group element (PGE) patterns showing enrichment in IPGE and depletion in PPGE. A variety of platinum group minerals are typically present in both types, occurring either as euhedral inclusions or along fractures in chromite grains. These minerals have a wide span of Re-Os isotopic compositions, reflecting a variety of origins.

There is a diversity of unusual minerals and mineral inclusions associated with podiform chromitites. The presence of these minerals suggest that grains of amphibolite (plagioclase, amphibole and zircon) and eclogite (coesite, kyanite and garnet) were present in the magmas from which chromite crystallized. Multiphase mineral inclusions demonstrate that podiform chromitites form from hydrous mafic magmas in suprasubduction zone environments (SSZ). We propose a new model in which chromitite formation was involved in intra-oceanic subduction zones initiated in closing oceanic basins. Continued subduction carries oceanic and possibly continental crustal materials to deep levels where they are metamorphosed under greenschist, amphibolite and eclogite facies conditions. The tearing and breakoff of the subducted slab, possibly along the transitional contact between amphibolites and eclogites, create a slab window through which the underlying asthenosphere rises and melts to generate Cr-rich mafic magmas. These upward-migrating magmas pass through the subduction zone and assimilate the subducted slab. As a result of slab contamination, these magmas become more siliceous, more oxidized and more hydrous, rapidly triggering chromite crystallization. Minute grains of chromite are suspended in the upward-moving magmas as they migrate through the overlying metasomatized mantle wedge. Such chromite-bearing magmas eventually deposit chromite in magma conduits in the uppermost mantle close to the Moho where the upward flow changes from vertical to subhorizontal and velocity is greatly reduced.

Highly reduced and ultrahigh pressure minerals including diamonds are reported in literature both in podiform chromitites and host peridotites of ophiolites. Some of these minerals in association with host peridotites may have been brought by the uprising asthenosphere at mid-oceanic ridges due to the mantle convection. It is also possible that some diamonds may have formed in the subducted slab below about 150 km. Some minerals of subducted slabs are preserved because they are encapsulated in chromite grains where they are protected from the SSZ melts. Some of these SSZ mantle wedges are emplaced on land to become podiform chromititebearing ophiolites. (C) 2014 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者关键词: Podiform chromitite; Chromite compositions; Associated minerals; Melt/rock interaction; Slab contamination

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作者: Wei, ZC (Wei, Zhouchao); Wang, RR (Wang, Rongrong); Liu, AP (Liu, Anping)

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摘要: The paper presents a new four-dimensional hyperchaotic system developed by extension of the generalized diffusionless Lorenz equations. The model is shown to not be equivalent to any hyperchaotic system that the authors know of. In particular, the model does not display any equilibria, but can exhibit two-scroll hyperchaos as well as chaotic, quasiperiodic and periodic dynamics. For certain parameter values, coexisting attractors can be observed, e.g. hyperchaotic and periodic attractors. Investigation of the proposed system is performed through a combination of numerical simulation and mathematical analysis in order to obtain time plots, phase portraits, Lyapunov exponents, and Poincare sections. (C) 2014 IMACS. Published by Elsevier B.V. All rights reserved.

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KeyWords Plus: CHAOTIC SYSTEM; DYNAMICAL BEHAVIORS; EQUATION

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作者: Cai, JC (Cai, Jianchao); Perfect, E (Perfect, Edmund); Cheng, CL (Cheng, Chu-Lin); Hu, XY (Hu, Xiangyun)

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摘要: Spontaneous imbibition of wetting liquids in porous media is a ubiquitous natural phenomenon which has received much attention in a wide variety of fields over several decades. Many traditional and recently presented capillary-driven flow models are derived based on Hagen-Poiseuille (H-P) flow in cylindrical capillaries. However, some limitations of these models have motivated modifications by taking into account different geometrical factors. In this work, a more generalized spontaneous imbibition model is developed by considering the different sizes and shapes of pores, the tortuosity of imbibition streamlines in random porous media, and the initial wetting-phase saturation. The interrelationships of accumulated imbibition weight, imbibition rate and gas recovery and the properties of the porous media, wetting liquids, and their interactions are derived analytically. A theoretical analysis and comparison denote that the presented equations can generalize several traditional and newly developed models from the literature. The proposed model was evaluated using previously published data for spontaneous imbibition measured in various natural and engineered materials including different rock types, fibrous materials, and silica glass. The test-results show that the generalized model can be used to characterize the spontaneous imbibition behavior of many different porous media and that pore shape cannot always be assumed to be cylindrical.

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标题: Outward-growth of the Tibetan Plateau during the Cenozoic: A review

作者: Wang, CS (Wang, Chengshan); Dai, JG (Dai, Jingen); Zhao, XX (Zhao, Xixi); Li, YL (Li, Yalin); Graham, SA (Graham, Stephan A.); He, DF (He, Dengfa); Ran, B (Ran, Bo); Meng, J (Meng, Jun)

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摘要: The surface uplift history of the Tibetan Plateau (TP) offers a key testing ground for evaluating models of collisional tectonics and holds important implications for processes ranging from global cooling to the onset of the Asian monsoon. Various models have been proposed to reveal the surface uplift history of the TP, but controversies remain. We evaluate these models using data from sedimentology and stratigraphy, structural geology, magmatism, exhumation, and paleoaltimetry studies. Structural analyses indicate that thrust belts, which spread from the central TP outward toward its surrounding margins, accommodated most of the India-Asia convergence, and facilitated crustal shortening and thickening in the central TP. Eocene adakitic rocks located in the Qiangtang and the Lhasa blocks likely were generated by partial melting of an eclogitic source. Paleogene (50-30 Ma) potassic rocks only occur in the Qiangtang block, whereas Late Oligocene-Late Miocene (26-8 Ma) potassic rocks occur both in the Qiangtang and Lhasa blocks. Low-temperature thermochronologic ages in the central TP are older than 40-35 Ma, whereas those in the margins are younger than 20 Ma (mostly Late Miocene, and Pliocene/Pleistocene in age). Independent paleoaltimetry estimates suggest that the Lhasa and Qiangtang terranes attained their current elevations during the Eocene, most likely due to the initial collision between India and Lhasa, whereas the Hoh Xil basin area to the north and Himalayas to the south were still low, even below sea level in the latter case. We argue for an inside-out growth pattern for the Tibetan Plateau. The TP grew southward and northward from a nucleus of high topography and is likely to continue expanding along the Mazar Tagh fault to the northwest, the Kuantai Shan-Hei Shan-Longshou Shan to the northeast, the Longquan Shan to the east and the Shillong plateau to the south if the northward force of India would not diminished. (C) 2014 Elsevier B.V. All rights reserved.

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语言: English

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作者关键词: India-Asia collision; Tibetan Plateau; Himalayas; Uplift; Cenozoic

KeyWords Plus: INDIA-ASIA COLLISION; APATITE FISSION-TRACK; ZANGBO SUTURE ZONE; RESOLUTION MAGNETO STRATIGRAPHY; ISOTOPE-BASED PALEOALTIMETRY; MESOZOIC TECTONIC EVOLUTION; HIMALAYAN METAMORPHIC CORE; DETRITAL ZIRCON PROVENANCE; FORELAND BASIN DEPOSITS; VS. ALTITUDE GRADIENTS

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摘要: This paper introduces a new no-equilibrium chaotic system that is constructed by adding a tiny perturbation to a simple chaotic flow having a line equilibrium. The dynamics of the proposed system are investigated through Lyapunov exponents, bifurcation diagram, Poincare map and period-doubling route to chaos. A circuit realization is also represented. Moreover, two other new chaotic systems without equilibria are also proposed by applying the presented methodology.

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作者关键词: Chaos; equilibrium; hidden attractor; Lyapunov exponent; bifurcation diagram; Poincare map

KeyWords Plus: CIRCUIT-DESIGN; FLOWS

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作者: Xiao, WJ (Xiao, Wenjiao); Santosh, M (Santosh, M.)

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摘要: The architecture of accretionary orogens is a key to understand continental growth. Here we present an overview of the orogenic components and their amalgamation in the western Central Asian Orogenic Belt (CAOB). The CAOB records the convergence and interactions among various types of orogenic components including the Japan-type, Mariana-type, and Alaska-Aleutian-type arc systems, as well as the active marginal sequences of the Siberia Craton, which incorporated wide accretionary complexes and accreted arcs and terranes. During construction of the CAOB, the Kazakhstan arc chain was characterized by multiple subduction, whereas the northern fringe of the Tarim Craton remained mostly as a passive margin. The multiple convergence and accretions among these various orogenic components generated huge orogenic collages in the late Paleozoic and even in the early Triassic, involving parallel amalgamation, circum-microcontinent amalgamation and oroclinal bending. The preservation of trapped basins played a significant role in orogenesis with some parts of the oceanic plate being subducted and others behaving as rigid units. The orogenesis in the CAOB was long-lived, lasting for more than 800 m.y., involving multiple-subduction and long, continuous accretion, and featuring the complexity of accretionary orogenesis and continent growth. (C) 2014 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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文献类型: Review

作者关键词: Multiple arc systems; Circum-microcontinent amalgamation; Tectonics; Continent growth; Central Asian Orogenic Belt

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标题: Shale Gas Potential of the Major Marine Shale Formations in the Upper Yangtze Platform, South China, Part III: Mineralogical, Lithofacial, Petrophysical, and Rock Mechanical Properties

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摘要: The marine black shale formations on the Upper Yangtze Platform, South China, are currently exploration targets for shale gas. Here, we report on the mineralogy, lithofacies, petrophysics, and rock mechanics of samples collected from the Ediacaran (Upper Sinian), Lower Cambrian, and Lower Silurian black shale intervals. All three formations are composed of high proportion of quartz, low content of clay, and rare or nonexistent content of carbonates. The Ediacaran and Lower Cambrian shales deposited in restricted deep water marine platform to marine basin environments are characterized by a higher quartz content and lower clay content than the Lower Silurian shales that were deposited in a more restricted marine basin environment. The carbonate content varies from 0 to over 50%, with the higher values measured in the Lower Silurian samples. These stratigraphic units were formed during bottom water anoxic conditions; therefore, they were rarely influenced by bioturbation. Lithologically, laminated and nonlaminated siliceous mudstones predominate, with minor contributions of other lithotypes. Pores generally have diameters in the nanometer (nm) to micrometer (mu m) range, and numerous pores occur in organic matter. Most of the measured samples have porosities less than 4%, although a few samples show porosity in excess of 10%. Pores with radii less than 50 nm contribute significantly to total pore volume and total porosity. Permeability is extremely low, and helium permeability coefficients (Klinkenberg corrected permeability coefficient) are less than 20.2 nD (nano-Darcy, similar to 2 x 10(-20) m(2)). The rock mechanical properties of the samples are characterized by high brittle behavior, which coincides with their high compressive and tensile strengths and elastic properties. The Lower Cambrian shale is generally more brittle than the Lower Silurian shales, which possess a relatively higher content of clay minerals. The rock mechanical properties of the measured samples, however, depend on the overall mineral compositions and physical properties.

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标题: The dilemma of the Jiaodong gold deposits: Are they unique?

作者: Goldfarb, RJ (Goldfarb, Richard J.); Santosh, M (Santosh, M.)

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摘要: The ca. 126-120 Ma Au deposits of the Jiaodong Peninsula, eastern China, define the country's largest gold province with an overall endowment estimated as >3000 t Au. The vein and disseminated ores are hosted by NE- to NNE-trending brittle normal faults that parallel the margins of ca. 165-150 Ma, deeply emplaced, lower crustal melt granites. The deposits are sited along the faults for many tens of kilometers and the larger orebodies are associated with dilatational jogs. Country rocks to the granites are Precambrian high-grade metamorphic rocks located on both sides of a Triassic suture between the North and South China blocks. During early Mesozoic convergent deformation, the ore-hosting structures developed as ductile thrust faults that were subsequently reactivated during Early Cretaceous "Yanshanian" intracontinental extensional deformation and associated gold formation.

Classification of the gold deposits remains problematic. Many features resemble those typical of orogenic Au including the linear structural distribution of the deposits, mineralization style, ore and alteration assemblages, and ore fluid chemistry. However, Phanerozoic orogenic Au deposits are formed by prograde metamorphism of accreted oceanic rocks in Cordilleran-style orogens. The Jiaodong deposits, in contrast, formed within two Precambrian blocks approximately 2 billion years after devolatilization of the country rocks, and thus require a model that involves alternative fluid and metal sources for the ores. A widespread suite of ca. 130-123 Ma granodiorites overlaps temporally with the ores, but shows a poor spatial association with the deposits. Furthermore, the deposit distribution and mineralization style is atypical of ores formed from nearby magmas. The ore concentration requires fluid focusing during some type of sub-crustal thermal event, which could be broadly related to a combination of coeval lithospheric thinning, asthenospheric upwelling, paleo-Pacific plate subduction, and seismicity along the continental-scale Tan-Lu fault. Possible ore genesis scenarios include those where ore fluids were produced directly by the metamorphism of oceanic lithosphere and overlying sediment on the subducting paleo-Pacific slab, or by devolatilization of an enriched mantle wedge above the slab. Both the sulfur and gold could be sourced from either the oceanic sediments or the serpentinized mantle. A better understanding of the architecture of the paleo-Pacific slab during Early Cretaceous below the eastern margin of China is essential to determination of the validity of possible models. (C) 2013, China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V. All rights reserved.

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摘要: Zircon U-Pb-Lu-Hf-O isotopic compositions of two granitic gneisses from the Kongling Terrain in the Yangtze Craton, South China were determined by SIMS, LA-ICP-MS and LA-MC-ICP-MS. Whole rocks of the two samples were analyzed for major and trace element compositions. The SIMS and LA-ICP-MS data reveal similar five zircon age groups of 3.4, 3.3, 2.9, 2.7, and 2.0 Ga for both gneisses. Three groups (magmatic Group A, metamorphic Group B, and overgrowth Group C) of the 3.4 Ga zircons were identified based on their CL images. These three groups have indistinguishable ages and Th/U ratios. Groups A and B show identical Hf-176/Hf-177 (t), although Group C was too thin to be analyzed by LA-ICP-MS. Taken together, zircons from the two samples with 98-102% age concordance give weighted average SIMS ages of 3434.3 +/- 9.6 Ma (2o-, MSWD = 13, n =8) for Group A, 3446.0 +/- 8.8 Ma (2a, MSWD = 10.7, 11 = 15) for Group B, and 3479 +/- 26 Ma (2o-,1VISWD = 0.49, n = 2) for Group C. Groups A and B together yield an upper intercept age of 3457 +/- 14 Ma (2o-, MSWD = 0.85, n=23). The LA-ICP-MS data yield weighted average ages of 3442 +/- 19 Ma (2a, MSWD =0.17, n = 7) for Group A and 3435 +/- 11 Ma (2a, MSWD = 0.44, n = 16) for Group B. They yield an upper intercept age of 3443 +/- 13 Ma (2 sigma, MSWD = 0.63, n = 23). These SIMS and LA-ICP-MS ages are consistent. We propose that the above SIMS and LA-ICP-MS ages of Groups A and B are the best estimates of the granitic magmatism and the subsequent metamorphism. The metamorphism must have occurred after the granitic magmatism within a few tens of million years, as constrained by their age errors. Accordingly, these two granitic gneisses represent the oldest rocks currently known in South China. They predate the previously reported 3300-Ma-old trondhjemitic gneiss from the Kongling Terrain by 150 Ma.

The 3.4 Ga zircons show near chondritic sElf (t) (-0.7 1.0, 2a, MSWD = 1.14, n =8), which is below the coeval value of the depleted mantle. This suggests that the granitic magma contained materials of preexisting continental crust. Their higher-than-mantle 8180 values (6.1-6.4%) imply that such materials must have been interacted with surface water. Crust formation ages (TDDA2) of the 3.4 Ga zircons vary from 3.9 to 3.6 Ga with a weighted average of 3703 27 Ma (2a, MSWD = 1.05, n = 7). Our results support previous studies that the Yangtze Craton may have contained the continental crust as old as 3.8 Ga.

Among the younger age groups, the 3.3 Ga zircons exhibit Hf-176/Hf-177 (t) and delta O-18 values similar to the 3.4 Ga zircons, suggesting that they were altered from the 3.4 Ga zircons. The 2.9 and 2.7 Ga zircons in both samples are rare and magmatic. Their Hf-176/Hf-177 (t) ratios are distinct from the 3.4 Ga zircons, indicating different sources. These two age groups are consistent with the 2.9 Ga trondhjemitic-tonalitic-granodioritic and the 2.7 Ga A-type granitic magmatism in the Kongling Terrain. The 2.0 Ga metamorphic zircons, regardless of being concordant or discordant, have Hf-176/Hf-177 (t) ratios overlapping those of the 2.7 Ga zircons, suggesting a common source. In contrast, delta O-18 of the 2.0 Ga zircons is strongly variable and positively correlated with age concordance. The low delta O-18 (down to 3.1%.) requires interaction with hydrothermal fluid. These results suggest that at least some of the 2.0 Ga zircons were likely to have been altered from the 2.7 Ga zircons by hydrothermal fluid. (C) 2014 Elsevier B.V. All rights reserved.

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摘要: An approach to determine carbon emission reduction target allocation based on the particle swarm optimization (PSO) algorithm, fuzzy c-means (FCM) clustering algorithm, and Shapley decomposition (PSO-FCM-Shapley) is proposed in this study. The method decomposes total carbon emissions into an interaction result of four components (i.e., emissions from primary, secondary, and tertiary industries, and from residential areas) which composed totally by 13 macro influential factors according to the KAYA identity. Then, 30 provinces in China are clustered into four classes according to the influential factors via the PSO-FCM clustering method. The key factors that determine emission growth in the provinces representing each cluster are investigated by applying Shapley value decomposition. Finally, based on guaranteed survival emissions, the reduction burden is allocated by controlling the key factors that decelerate CO2 emission growth rate according to the present economic development level, energy endowments, living standards, and the emission intensity of each province. A case study of the allocation of CO2 intensity reduction targets in China by 2020 is then conducted via the proposed method. The per capita added value of the secondary industry is the primary factor for the increasing carbon emissions in provinces. Therefore, China should limit the growth rate of its secondary industry to mitigate emission growth. Provinces with high cardinality of emissions have to shoulder the largest reduction, whereas provinces with low emission intensity met the minimum requirements for emission in 2010. Fifteen provinces are expected to exceed the national average decrease rates from 2011 to 2020. (C) 2013 Elsevier Ltd. All rights reserved.

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作者: Guo, HM (Guo, Huaming); Wen, DG (Wen, Dongguang); Liu, ZY (Liu, Zeyun); Jia, YF (Jia, Yongfeng); Guo, Q (Guo, Qi)

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摘要: China is a typical high-As region, where 20 provinces have high As groundwaters among 34 provinces. These groundwaters usually occur in both arid-semiarid inland basins and river deltas. In the inland basins, mainly distributed in the northwest of China, shallow groundwaters usually have high As concentrations in alluvial lacustrine or lacustrine sediment aquifers, while high As groundwater mainly occurs in fluvial-marine sedimentary aquifers in the river deltas, which have been affected by transgression. In both the inland basins and the river deltas, high As groundwaters, mainly occurring in reducing conditions, are characterized by high Fe and Mn concentrations, high pH and HCO3- concentration, and relatively low NO3 and SO24 concentrations. Although As contents are well correlated to Fe/Mn contents in the aquifer sediments, groundwater As concentrations are generally independent of sediment As contents. Redox processes, microbe-related reduction, and desorption processes are the major geochemical processes for As enrichment in groundwaters. In reducing conditions, both reductive dissolution of Fe oxides and reductive desorption of As are believed to result in As mobilization, which would be catalyzed by indigenous microbes. Although decomposition of the low-molecular weight organic matter during microbe metabolization would also release the colloid-bound As into groundwater, the cycling of colloidal As still needs to be further investigated during redox processes. Besides, high pH and high HCO3- lead to As desorption from adsorption sites in the aquifer systems. However, the contribution of competitive desorption to high As concentrations is still unknown and remains to be discovered, relative to reductive dissolution of Fe oxides, especially in the inland basins. (C) 2014 Elsevier Ltd. All rights reserved.

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标题: Continental orogenesis from ocean subduction, continent collision/subduction, to orogen collapse, and orogen recycling: The example of the North Qaidam UHPM belt, NW China

作者: Song, SG (Song, Shuguang); Niu, YL (Niu, Yaoling); Su, L (Su, Li); Zhang, C (Zhang, Cong); Zhang, LF (Zhang, Lifei)

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摘要: The North Qaidam ultra-high pressure metamorphic (UHPM) belt in the northern Tibetan Plateau records a complete history of the evolution of a continental orogen from prior seafloor subduction, to continental collision and subduction, and to the ultimate orogen collapse in the time period from the Neoproterozoic to the Paleozoic. Lithologies in this UHPM belt consist predominantly of felsicgneisses containing blocks of edogite and peridotite. The 1120-900 Ma granitic and psammitic/pelitic gneisses compose the majority of the UHPM belt and is genetically associated with the previous orogenic cycle of Grenville-age, whereas protoliths of the HUPM eclogites are of both the 850-820 Ma continental flood basalts (CFBs) and the 540-500 Ma oceanic crust (ophiolite). The early stage of quartz-stable eclogite-facies metamorphism took place at -445-473 Ma, the same age as that of the HP rocks in the North Qilian oceanic suture zone, representing the earliest subducting seafloor rocks exhumed and preserved. Coesite-bearing zircons from the metapelite and eclogite, diamond-bearing zircons from garnet peridotites constrain the UHP metamorphic age of -438-420 Ma, which represents the timing of continental subduction at depths of 100-200 km, -10-20 m.y. younger than the early stage of the (lian seafloor subduction. Therefore, deep subduction of continental crust should be the continuation of oceanic subduction that is pulled down by the sinking oceanic lithosphere or pushed down by the overriding upper plate, which is an expected and inevitable consequence for the scenario of passive continental margins. Partial melting of subducted ocean crust might occur in response to continental subduction at -435 Ma.

The UHPM rocks started to exhume accompanied by mountain building and deposition of Early Devonian molasses in the North Qilian region at -420 Ma. Decoupling of oceanic subduction zone and continent UHPM terranes may be attributed to the different exhumation path and mechanism between the subducted oceanic and continent crusts, or rollback of subduction zone. Decompression melting of UHP metamorphosed slab and continental crust during exhumation is responsible for the generation of adaldtic melts and S-type granite. Mountain collapse and lithosphere extension happened in the period of -400-360 Ma and formed diorite-granite intrusions in the UHPM belt, which marked the end of a complete orogenic cycle.

This UHP metamorphic belt presents an example of multi-epoch tectonic recycles, represented by recombination of the Neoproterozoic Grenvillian orogenesis and the Early Paleozoic Caledonian orogenesis. (C) 2013 Elsevier B.V. All rights reserved.

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作者: Mao, JW (Mao, Jingwen); Pirajno, F (Pirajno, Franco); Lehmann, B (Lehmann, Bernd); Luo, MC (Luo, Maocheng); Berzina, A (Berzina, Anita)

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摘要: In the Eurasian continent there are three huge metallogenic belts of Cu and Mo porphyry deposits, comprising the Paleozoic Central Asian Ore Belt in the north, the Tethyan Eurasian Ore Belt of Jurassic to Cenozoic age in the southwest, and the East Margin Ore Belt of the Eurasian Continent of Jurassic to Cretaceous age in the east. The latter is considered to be part of the vast Circum-Pacific ore belt. Some of the main features of the spatial-temporal distribution of Cu and Mo porphyry systems and related geodynamic processes of the three metallogenic belts are described. In particular, the key role of post-subduction - related porphyry ore systems is emphasized, comprising collisional and post-collisional Cu-Mo porphyry deposits during the geological history of the Eurasian continent. The recurrent feature of these ore systems and related felsic rocks is their derivation from partial melting of stagnant or residual oceanic slabs, and mixing with a variable amount of crustal material during magma ascent to shallower levels. (C) 2013 Published by Elsevier Ltd.

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标题: Phanerozoic continental growth and gold metallogeny of Asia

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摘要: The Asian continent formed during the past 800 m.y. during late Neoproterozoic through Jurassic closure of the Tethyan ocean basins, followed by late Mesozoic circum-Pacific and Cenozoic Himalayan orogenies. The oldest gold deposits in Asia reflect accretionary events along the margins of the Siberia, Kazakhstan, North China, Tarim-Karakum, South China, and Indochina Precambrian blocks while they were isolated within the Paleotethys and surrounding Panthalassa Oceans. Orogenic gold deposits are associated with large-scale, terrane-bounding fault systems and broad areas of deformation that existed along many of the active margins of the Precambrian blocks. Deposits typically formed during regional transpressional to transtensional events immediately after to as much as 100 m.y. subsequent to the onset of accretion or collision. Major orogenic gold provinces associated with this growth of the Asian continental mass include: (1) the ca. 750 Ma Yenisei Ridge, ca. 500 Ma East Sayan, and ca. 450-350 Ma Patom provinces along the southern margins of the Siberia craton; (2) the 450 Ma Charsk belt of north-central Kazakhstan; (3) the 310-280 Ma Kalba belt of NE Kazakhstan, extending into adjacent NW Xinjiang, along the Siberia-Kazakhstan suture; (4) the ca. 300-280 Ma deposits within the Central Asian southern and middle Tien Shan (e.g., Kumtor, Zarmitan, Muruntau), marking the closure of the Turkestan Ocean between Kazakhstan and the Tarim-Karalcum block; (5) the ca. 190-125 Ma Transbaikal deposits along the site of Permian to Late Jurassic diachronous closure of the Mongol-Okhotsk Ocean between Siberia and Mongolia/North China; (6) the probable Late Silurian-Early Devonian Jiagnan belt formed along the margin of Gondwana at the site of collision between the Yangtze and Cathaysia blocks; (7) Triassic deposits of the Paleozoic Qilian Shan and West Qinling orogens along the SW margin of the North China block developed during collision of South China; and (8) Jurassic(?) ores on the margins of the Subumusu block in Myanmar and Malaysia. Circum-Pacific tectonism led to major orogenic gold province formation along the length of the eastern side of Asia between ca. 135 and 120 Ma, although such deposits are slightly older in South Korea and slightly younger in the Amur region of the Russian Southeast. Deformation related to collision of the Kolyma-Omolon microcontinent with the Pacific margin of the Siberia craton led to formation of 136-125 Ma ores of the Yana-Kolyma belt (Natalka, Sarylakh) and 125-119 Ma ores of the South Verkhoyansk synclinorium (Nezhdaninskoe). Giant ca. 125 Ma gold provinces developed in the late Archean uplifted basement of the decratonized North China block, within its NE edge and into adjacent North Korea, in the Jiaodong Peninsula, and in the Qinling Mountains. The oldest gold-bearing magmatic-hydrothermal deposits of Asia include the ca. 485 Ma Duobaoshan porphyry within a part of the Tuva-Mongol arc, ca. 355 Ma low-sulfidation epithermal deposits (Kubaka) of the Omolon terrane accreted to eastern Russia, and porphyries (Bozshakol, Taldy Bulak) within Ordovican to Early Devonian oceanic arcs formed off the Kazakhstan microcontinent The Late Devonian to Carboniferous was marked by widespread gold-rich porphyry development along the margins of the closing Ob-Zaisan, Junggar-Balkhash, and Turkestan basins (Amalyk, Oyu Tolgoi); most were formed in continental arcs, although the giant Oyu Tolgoi porphyry was part of a near-shore oceanic arc.

Permian subduction-related deformation along the east side of the Indochina block led to ca. 300 Ma gold-bearing skarn and disseminated gold ore formation in the Truong Son fold belt of Laos, and along the west side to ca. 250 Ma gold-bearing skarns and epithermal deposits in the Loei fold belt of Laos and Thailand. In the Mesozoic Transbaikal region, extension along the basin margins subsequent to Mongol-Okhotsk closure was associated with ca. 150-125 Ma formation of important auriferous epithermal (Balei), skarn (Bystray), and porphyry (Kultuminskoe) deposits. In northeastern Russia, Early Cretaceous Pacific margin subduction and Late Cretaceous extension were associated with epithermal gold-deposit formation in the Uda-Murgal (Julietta) and Okhotsk-Chukotka (Dukat, Kupol) volcanic belts, respectively. In southeastern Russia, latest Cretaceous to Oligocene extension correlates with other low-sulfidation epithermal ores that formed in the East Sikhote-Alin volcanic belt. Other extensional events, likely related to changing plate dynamics along the Pacific margin of Asia, relate to epithermal-skarn-porphyry districts that formed at ca. 125-85 Ma in northeastmost China and ca. 105-90 Ma in the Coast Volcanic belt of SE China. The onset of strike slip along a part of the southeastern Pacific margin appears to correlate with the giant 148-135 Ma gold-rich porphyry-skarn province of the lower and middle Yangtze River. It is still controversial as to whether true Carlin-like gold deposits exist in Asia. Those deposits that most closely resemble the Nevada (USA) ores are those in the Permo-Triassic Youjiang basin of SW China and NE Vietnam, and are probably Late Triassic in age, although this is not certain. Other Carlin-like deposits have been suggested to exist in the Sepon basin of Laos and in the Mongol-Okhotsk region (Kuranakh) of Transbaikal. Published by Elsevier B.V. on behalf of International Association for Gondwana Research.

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摘要: The link between metallogeny and craton destruction in the North China Craton (NCC) remains poorly understood, particularly the mechanisms within the interior of the craton. In this overview, we summarize the major stages in the history of formation and evolution of the NCC, the spatio-temporal distribution and types of major ore species, as well as mantle contribution to the metallogeny, in an attempt to evaluate the geodynamic settings of metallogeny and the mechanisms of formation of the ore deposits. The early Precambrian history of the NCC witnessed the amalgamation of micro-blocks and construction of the fundamental tectonic architecture of the craton by 2.5 Ga. The boundaries of these micro-blocks and the margins of the NCC remained as weak zones and were the principal locales along which inhomogeneous destruction of the craton occurred during later tectonothermal events. These zones record the formation of orogeny related gold, copper, iron and titanium during the early to middle Paleoproterozoic with ages ranging from 2.5 to 1.8 Ma. The Early Ordovician kimberlite and diamond mineralization at ca. 480 Ma, the Late Carboniferous and Early to middle Permian calc-alkaline, I-type granitoids and gold deposits of 324-300 Ma, and the Triassic alkaline rocks and gold silver-polymetallic deposits occurring along these zones and the margins of the blocks correlate with rising mantle plume, southward subduction of the Siberian plate and northward subduction of the Yangtze plate, respectively. The voluminous Jurassic granitoids and Cretaceous intrusives carrying gold, molybdenum, copper, lead and zinc deposits are also localized along the weak zones and block margins. The concentration of most of these deposits in the eastern part of the NCC invokes correlation with lithosphere thinning associated with the westward subduction of the Pacific plate. Although magmatism and mineralization have been recorded along the margins and few places within the interior of the NCC in the Jurassic, their peak occurred in the Cretaceous in the eastern part of the NCC, marking large scale destruction of the craton at this time. The junctions of the boundaries between the micro-continental blocks are characterized by extensive inhomogeneous thinning. We propose that these junctions are probably for future mineral exploration targeting in the NCC. (C) 2013 Elsevier B.V. All rights reserved.

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摘要: The recognition that Earth history has been punctuated by supercontinents, the assembly and breakup of which have profoundly influenced the evolution of the geosphere, hydrosphere, atmosphere and biosphere, is arguably the most important development in Earth Science since the advent of plate tectonics. But whereas the widespread recognition of the importance of supercontinents is quite recent, the concept of a supercontinent cycle is not new and advocacy of episodicity in tectonic processes predates plate tectonics. In order to give current deliberations on the supercontinent cycle some historical perspective, we trace the development of ideas concerning long-term episodicity in tectonic processes from early views on episodic orogeny and continental crust formation, such as those embodied in the chelogenic cycle, through the first realization that such episodicity was the manifestation of the cyclic assembly and breakup of supercontinents, to the surge in interest in supercontinent reconstructions. We then chronicle some of the key contributions that led to the cycle's widespread recognition and the rapidly expanding developments of the past ten years. (C) 2013 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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摘要: The accretionary complexes of Central and East Asia (Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Mongolia, and China) and the Western Pacific (China, Japan, Russia) preserve valuable records of ocean plate stratigraphy (UPS). From a comprehensive synthesis of the nature of occurrence, geochemical characteristics and geochronological features of the oceanic island basalts (OM) and ophiolite units in the complexes, we track extensive plume-related magmatism in the Paleo-Asian and Paleo-Pacific Oceans. We address the question of continuous versus episodic intraplate magmatism and its contribution to continental growth. An evaluation of the processes of subduction erosion and accretion illustrates continental growth at the active margins of the Siberian, Kazakhstan, Tarim and North China blocks, the collision of which led to the construction of the Central Asian Orogenic Belt (CAOB). Most of the OIB-bearing UPS units of the CAOB and the Western Pacific formed in relation to two superplumes: the Asian (late Neoproterozoic) and the Pacific (Cretaceous), with a continuing hot mantle upwelling in the Pacific region that contributes to the formation of modern OIBs. Our study provides further insights into the processes of continental construction because the accreted seamounts play an important role in the growth of convergent margins and enhance the accumulation of fore-arc sediments. (C) 2012 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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摘要: The Lhasa terrane in southern Tibet is composed of Precambrian crystalline basement, Paleozoic to Mesozoic sedimentary strata and Paleozoic to Cenozoic magmatic rocks. This terrane has long been accepted as the last crustal block to be accreted with Eurasia prior to its collision with the northward drifting Indian continent in the Cenozoic. Thus, the Lhasa terrane is the key for revealing the origin and evolutionary history of the Himalayan-Tibetan orogen. Although previous models on the tectonic development of the orogen have much evidence from the Lhasa terrane, the metamorphic history of this terrane was rarely considered. This paper provides an overview of the temporal and spatial characteristics of metamorphism in the Lhasa terrane based mostly on the recent results from our group, and evaluates the geodynamic settings and tectonic significance. The Lhasa terrane experienced multistage metamorphism, including the Neoproterozoic and Late Paleozoic HP metamorphism in the oceanic subduction realm, the Early Paleozoic and Early Mesozoic MP metamorphism in the continent-continent collisional zone, the Late Cretaceous HT/MP metamorphism in the mid-oceanic ridge subduction zone, and two stages of Cenozoic MP metamorphism in the thickened crust above the continental subduction zone. These metamorphic and associated magmatic events reveal that the Lhasa terrane experienced a complex tectonic evolution from the Neoproterozoic to Cenozoic. The main conclusions arising from our synthesis are as follows: (1) The Lhasa block consists of the North and South Lhasa terranes, separated by the Paleo-Tethys Ocean and the subsequent Late Paleozoic suture zone. (2) The crystalline basement of the North Lhasa terrane includes Neoproterozoic oceanic crustal rocks, representing probably the remnants of the Mozambique Ocean derived from the break-up of the Rodinia supercontinent. (3) The oceanic crustal basement of North Lhasa witnessed a Late Cryogenian (similar to 650 Ma) HP metamorphism and an Early Paleozoic (similar to 485 Ma) MP metamorphism in the subduction realm associated with the closure of the Mozambique Ocean and the final amalgamation of Eastern and Western Gondwana, suggesting that the North Lhasa terrane might have been partly derived from the northern segment of the East African Orogen. (4) The northern margin of Indian continent including the North and South Lhasa, and Qiangtang terranes, experienced Early Paleozoic magmatism, indicating an Andean-type orogeny that resulted from the subduction of the Proto-Tethys Ocean after the final amalgamation of Gondwana. (5) The Lhasa and Qiangtang terranes witnessed Middle Paleozoic (similar to 360 Ma) magmatism, suggesting an Andean-type orogeny derived from the subduction of the Paleo-Tethys Ocean. (6) The closure of Paleo-Tethys Ocean between the North and South Lhasa terranes and subsequent terrane collision resulted in the formation of Late Permian (similar to 260 Ma) HP metamorphic belt and Triassic (220 Ma) MP metamorphic belt. (7) The South Lhasa terrane experienced Late Cretaceous (similar to 90 Ma) Andean-type orogeny, characterized by the regional HT/MP metamorphism and coeval intrusion of the voluminous Gangdese batholith during the northward subduction of the Neo-Tethyan Ocean. (8) During the Early Cenozoic (55-45 Ma), the continent-continent collisional orogeny has led to the thickened crust of the South Lhasa terrane experiencing MP amphibolite-facies metamorphism and syn-collisional magmatism.

(9) Following the continuous continent convergence, the South Lhasa terrane also experienced MP metamorphism during Late Eocene (40-30 Ma). (10) During Mesozoic and Cenozoic, two different stages of paired metamorphic belts were formed in the oceanic or continental subduction zones and the middle and lower crust of the hanging wall of the subduction zone. The tectonic imprints from the Lhasa terrane provide excellent examples for understanding metamorphic processes and geodynamics at convergent plate boundaries. (C) 2012 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者: Gong, WY (Gong, Wenyin); Cai, ZH (Cai, Zhihua)

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摘要: Differential evolution (DE) has been proven to be one of the most powerful global numerical optimization algorithms in the evolutionary algorithm family. The core operator of DE is the differential mutation operator. Generally, the parents in the mutation operator are randomly chosen from the current population. In nature, good species always contain good information, and hence, they have more chance to be utilized to guide other species. Inspired by this phenomenon, in this paper, we propose the ranking-based mutation operators for the DE algorithm, where some of the parents in the mutation operators are proportionally selected according to their rankings in the current population. The higher ranking a parent obtains, the more opportunity it will be selected. In order to evaluate the influence of our proposed ranking-based mutation operators on DE, our approach is compared with the jDE algorithm, which is a highly competitive DE variant with self-adaptive parameters, with different mutation operators. In addition, the proposed ranking-based mutation operators are also integrated into other advanced DE variants to verify the effect on them. Experimental results indicate that our proposed ranking-based mutation operators are able to enhance the performance of the original DE algorithm and the advanced DE algorithms.

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标题: Qinghu zircon: A working reference for microbeam analysis of U-Pb age and Hf and O isotopes

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摘要: Zircon is the most useful mineral for studies in U-Pb geochronology and Hf and O isotope geochemistry. Matrix effect is a major problem of the microbeam techniques such as SIMS and LA-(MC)-ICPMS. Therefore, external standardization using well-characterized natural zircon standards is fundamental for accurate microbeam measurements. While the isotopic geochronology and geochemistry laboratories equipped with microbeam analytical facilities have been increasingly established in China during the past decade, applications of the isotopic microanalysis are still limited due to shortage of available standards. We report here the Qinghu zircon as a potential new working reference for microbeam analysis of zircon U-Pb age and O-Hf isotopes. This zircon was separated from the Qinghu quartz monzonite from the western Nanling Range, Southeast China. It is fairly homogeneous in U-Pb age and Hf and O isotopes in terms of large amounts of mircobeam measurements by LA-MC-ICPMS and SIMS at the scales of 20-60 mu m. SIMS measurements yield consistent Pb-206/U-238 age within analytical uncertainties with that obtained by ID-TIMS. Precise determinations of O isotopes by IRMS and Hf isotopes by solution MC-ICPMS are in good agreement with the statistical mean of microbeam measurements. We recommend U-Pb age of = 159.5 +/- 0.2 Ma (2SE), delta O-18 = 5.4aEuro degrees +/- 0.2aEuro degrees (2SD) and Hf-176/Hf-177 = 0.283002 +/- 0.000004 (2SD) as the best reference values for the Qinghu zircon.

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作者关键词: Qinghu; zircon; standard; U-Pb age; O and Hf isotopes; SIMS; LA-MC-ICPMS

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标题: Two Novel Bi-Based Borate Photocatalysts: Crystal Structure, Electronic Structure, Photoelectrochemical Properties, and Photocatalytic Activity under Simulated Solar Light Irradiation

作者: Huang, HW (Huang, Hongwei); He, Y (He, Ying); Lin, ZS (Lin, Zheshuai); Kang, L (Kang, Lei); Zhang, YH (Zhang, Yihe)

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摘要: Through the combination of Bi3+ and a large negative charge ion (BO3)(3-), two novel Bi-based borate photocatalysts Bi4B2O9 and Bi2O2[BO2(OH)] with layered structure have been successfully developed. For the first time, the borates were investigated as photocatalysts. They were synthesized by solid-state reaction and hydrothermal method, respectively, and further characterized by XRD, SEM, TEM, HRTEM, and DRS. Bi4B2O9 and Bi2O2[BO2(OH)] possess direct and indirect transition optical band gaps of 3.02 and 2.85 eV, respectively. Density functional calculations revealed that the valence band (VB) and conduction band (CB) of both borates were composed of hybridized states of the O 2p and Bi 6p or 6s orbitals, and a large dispersion was observed in the energy band of Bi2O2[BO2(OH)]. The photodecomposition experiments demonstrated that Bi4B2O9 and Bi2O2[BO2(OH)] can be used as effective photocatalysts under simulated solar irradiation, and Bi2O2[BO2(OH)] exhibits the high photocatalytic activity, which is 2.5 and 3.2 times compared with that of P25 and Bi2O2CO3, respectively. Moreover, the photocurrent conversion further confirmed that Bi4B2O9 and Bi2O2[BO2(OH)] were potential photofunctional materials. The layered structure with (Bi2O2)(2+) layer, hybridized and dispersion energy band, and large negative charge of (BO3)(3-) ion should be responsible for the high photocatalytic activity of Bi2O2[BO2(OH)].

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作者: Zhang, GW (Zhang GuoWei); Guo, AL (Guo AnLin); Wang, YJ (Wang YueJun); Li, SZ (Li SanZhong); Dong, YP (Dong YunPeng); Liu, SF (Liu ShaoFeng); He, DF (He DengFa); Cheng, SY (Cheng ShunYou); Lu, RK (Lu RuKui); Yao, AP (Yao AnPing)

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摘要: This paper aims at exploring the tectonic characteristics of the South China Continent (SCC) and extracting the universal tectonic rules from these characteristics, to help enrich the plate tectonic theory and better understand the continental dynamic system. For this purpose, here we conduct a multi-disciplinary investigation and combine it with the previous studies to reassess the tectonics and evolution of SCC and propose that the tectonic framework of the continent comprises two blocks, three types of tectonic units, four deformation systems, and four evolutionary stages with distinctive mechanism and tectonic characteristics since the Neoproterozoic. The four evolutionary stages are: (1) The amalgamation and break-up of the Neoproterozoic plates, typically the intracontinental rifting. (2) The early Paleozoic and Mesozoic intracontinental orogeny confined by plate tectonics, forming two composite tectonic domains. (3) The parallel operation of the Yangtze cratonization and intracontinental orogeny, and multi-phase reactivation of the Yangtze craton. (4) The association and differentiation evolution of plate tectonics and intracontinental tectonics, and the dynamic characteristics under the Meso-Cenozoic modern global plate tectonic regime.

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摘要: The structural properties of clinopyroxene NaScSi2O6 have been investigated using the X-ray powder diffraction refinement, and the luminescence properties of Eu2+ and Eu2+/Mer-activated NaScSi2O6 have been studied to explore the new materials for phosphor-converted white light ultraviolet light-emitting diodes (UV-LEDs). Eu2+ was introduced into the NaScSi2O6 host in the reducing atmosphere, and the preferred crystallographic positions of the Eu2+ ions were determined based on the different structural models of the NaScSi2O6 host. The as-obtained NaScSi2O6:Eu2+ phosphor shows greenish yellow emission with the broad-band peak at 533 nm, and efficient energy transfer (ET) takes place between Eu2+ and Mn2+ in NaScSi2O6, leading to a series of color-tunable phosphors emitting at 533 and 654 nm for the designed NaScSi2O6:Eu2+,Mn2+ phosphors under excitation at 365 nm. The ET mechanism of Eu2+ and Mn2+ has also been evaluated. We have demonstrated that NaScSi2O6:Eu2+ and NaScSi2O6:Eu2+,Mn2+ materials exhibit great potential to act as the effective phosphors for UV-LEDs.

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摘要: The East African Orogen, extending from southern Israel, Sinai and Jordan in the north to Mozambique and Madagascar in the south, is the worlds largest Neoproterozoic to Cambrian orogenic complex. It comprises a collage of individual oceanic domains and continental fragments between the Archean Sahara-Congo-Kalahari Cratons in the west and Neoproterozoic India in the east. Orogen consolidation was achieved during distinct phases of orogeny between similar to 850 and 550 Ma. The northern part of the orogen, the Arabian-Nubian Shield, is predominantly juvenile Neoproterozoic crust that formed in and adjacent to the Mozambique Ocean. The ocean closed during a protracted period of island-arc and microcontinent accretion between similar to 850 and 620 Ma. To the south of the Arabian Nubian Shield, the Eastern Granulite-Cabo Delgado Nappe Complex of southern Kenya, Tanzania and Mozambique was an extended crust that formed adjacent to theMozambique Ocean and experienced a similar to 650-620 Ma granulite-facies metamorphism. Completion of the nappe assembly around 620 Ma is defined as the East African Orogeny and was related to closure of the Mozambique Ocean. Oceans persisted after 620 Ma between East Antarctica, India, southern parts of the Congo-Tanzania-Bangweulu Cratons and the Zimbabwe-Kalahari Craton. They closed during the similar to 600-500 Ma Kuungan or Malagasy Orogeny, a tectonothermal event that affected large portions of southern Tanzania, Zambia, Malawi, Mozambique, Madagascar and Antarctica. The East African and Kuungan Orogenies were followed by phases of post-orogenic extension. Early similar to 600-550 Ma extension is recorded in the Arabian-Nubian Shield and the Eastern Granulite-Cabo Delgado Nappe Complex. Later similar to 550-480 Ma extension affected Mozambique and southern Madagascar. Both extension phases, although diachronous,are interpreted as the result of lithospheric delamination. Along the strike of the East African Orogen, different geodynamic settings resulted in the evolution of distinctly different orogen styles. The Arabian-Nubian Shield is an accretion-type orogen comprising a stack of thin-skinned nappes resulting from the oblique convergence of bounding plates. The Eastern Granulite-Cabo Delgado Nappe Complex is interpreted as a hot- to ultra-hot orogen that evolved from a formerly extended crust. Low viscosity lower crust resisted one-sided subduction, instead a sagduction-type orogen developed. The regions of Tanzania and Madagascar affected by the Kuungan Orogeny are considered a Himalayan-type orogen composed of partly doubly thickened crust. (C) 2013 The Authors. Published by Elsevier Ltd. All rights reserved.

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作者: Xu, WL (Xu, Wen-Liang); Pei, FP (Pei, Fu-Ping); Wang, F (Wang, Feng); Meng, E (Meng, En); Ji, WQ (Ji, Wei-Qiang); Yang, DB (Yang, De-Bin); Wang, W (Wang, Wei)

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摘要: LA-ICP-MS zircon U-Pb ages and geochemical data are presented for the Mesozoic volcanic rocks in northeast China, with the aim of determining the tectonic settings of the volcanism and constraining the timing of the overprinting and transformations between the Paleo-Asian Ocean, Mongol-Okhotsk, and circum-Pacific tectonic regimes. The new ages, together with other available age data from the literature, indicate that Mesozoic volcanism in NE China can be subdivided into six episodes: Late Triassic (228-201 Ma), Early-Middle Jurassic (190-173 Ma), Middle-Late Jurassic (166-155 Ma), early Early Cretaceous (145-138 Ma), late Early Cretaceous (133-106 Ma), and Late Cretaceous (97-88 Ma). The Late Triassic volcanic rocks occur in the Lesser Xing'an-Zhangguangcai Ranges, where the volcanic rocks are bimodal, and in the eastern Heilongjiang-Jilin provinces where the volcanics are A-type rhyolites, implying that they formed in an extensional environment after the final closure of the Paleo-Asian Ocean. The Early-Middle Jurassic (190-173 Ma) volcanic rocks, both in the Erguna Massif and the eastern Heilongjiang-Jilin provinces, belong chemically to the calc-alkaline series, implying an active continental margin setting. The volcanics in the Erguna Massif are related to the subduction of the Mongol-Okhotsk oceanic plate beneath the Massif, and those in the eastern Jilin-Heilongjiang provinces are related to the subduction of the Paleo-Pacific Plate beneath the Eurasian continent. The coeval bimodal volcanic rocks in the Lesser Xing'an-Zhangguangcai Ranges were probably formed under an extensional environment similar to a backarc setting of double-direction subduction. Volcanic rocks of Middle-Late Jurassic (155-166 Ma) and early Early Cretaceous (145-138 Ma) age only occur in the Great Xing'an Range and the northern Hebei and western Liaoning provinces (limited to the west of the Songliao Basin), and they belong chemically to high-K calc-alkaline series and A-type rhyolites, respectively. Combined with the regional unconformity and thrust structures in the northern Hebei and western Liaoning provinces, we conclude that these volcanics formed during a collapse or delamination of a thickened continental crust related to the evolution of the Mongol-Okhotsk suture belt. The late Early Cretaceous volcanic rocks, widely distributed in NE China, belong chemically to a low- to medium-K calc-alkaline series in the eastern Heilongjiang-Jilin provinces (i.e., the Eurasian continental margin), and to a bimodal volcanic rock association within both the Songliao Basin and the Great Xing'an Range. The volcanics in the eastern Heilongjiang-Jilin provinces formed in an active continental margin setting related to the subduction of the Paleo-Pacific Plate beneath the Eurasian continent, and the bimodal volcanics formed under an extensional environment related either to a backarc setting or to delamination of a thickened crust, or both. Late Cretaceous volcanics, limited to the eastern Heilongjiang-Jilin provinces and the eastern North China Craton (NCC), consist of calc-alkaline rocks in the eastern Heilongjiang-Jilin provinces and alkaline basalts in the eastern NCC, suggesting that the former originated during subduction of the Paleo-Pacific Plate beneath the Eurasian continent, whereas the latter formed in an extensional environment similar to a backarc setting.

Taking all this into account, we conclude that (1) the transformation from the Paleo-Asian Ocean regime to the circum-Pacific tectonic regime happened during the Late Triassic to Early Jurassic; (2) the effect of the Mongol-Okhotsk suture belt on NE China was mainly in the Early Jurassic, Middle-Late Jurassic, and early Early Cretaceous; and (3) the late Early Cretaceous and Late Cretaceous volcanics can be attributed to the subduction of the Paleo-Pacific Plate beneath the Eurasian continent. (C) 2013 Elsevier Ltd. All rights reserved.

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摘要: Data envelopment analysis (DEA) has recently become a popular approach in measuring the energy and environmental performance at the macro-economy level. A common limitation of several previous studies is that they ignored the undesirable outputs and did not consider the separation of inputs into energy resources and non-energy resources under the DEA framework. Thus, within a joint production framework of considering both desirable and undesirable outputs, as well as energy and non-energy inputs, this study analyzes China's regional total-factor energy and environmental efficiency. This paper utilizes improved DEA models to measure the energy and environmental efficiency of 29 administrative regions of China during the period of 2000-2008. In addition, the DEA window analysis technique is applied to measure the efficiency in cross-sectional and time-varying data. The empirical results show that the east area of China has the highest energy and environmental efficiency, while the efficiency of the west area is worst. All three areas of China have similar trends in the variation of efficiency and in general the energy and environmental efficiency of China slightly increased from 2000 to 2008. The regions of the east area have a more balanced development than the regions of the central area and west area according to energy and environmental efficiency. (C) 2011 Elsevier Ltd. All rights reserved.

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标题: Locating South China in Rodinia and Gondwana: A fragment of greater India lithosphere?

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摘要: From the formation of Rodinia at the end of the Mesoproterozoic to the commencement of Pangea breakup at the end of the Paleozoic, the South China craton first formed and then occupied a position adjacent to Western Australia and northern India. Early Neoproterozoic suprasubduction zone magmatic arc-backarc assemblages in the craton range in age from ca. 1000 Ma to 820 Ma and display a sequential northwest decrease in age. These relations suggest formation and closure of arc systems through southeast-directed subduction, resulting in progressive northwestward accretion onto the periphery of an already assembled Rodinia. Siliciclastic units within an early Paleozoic succession that transgresses across the craton were derived from the southeast and include detritus from beyond the current limits of the craton. Detrital zircon age spectra require an East Gondwana source and are very similar to the Tethyan Himalaya and younger Paleozoic successions from Western Australia, suggesting derivation from a common source and by inference accumulation in linked basins along the northern margin of Gondwana, a situation that continued until rifting and breakup of the craton in the late Paleozoic.

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标题: Parameter extraction of solar cell models using repaired adaptive differential evolution

作者: Gong, WY (Gong, Wenyin); Cai, ZH (Cai, Zhihua)

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摘要: Parameter extraction of solar cell models plays an important role in the simulation and design calculation of photovoltaic (PV) systems. In this paper, in order to fast and accurately extract the solar cell parameters, an improved adaptive differential evolution with crossover rate repairing technique and ranking-based mutation is proposed. The proposed method is referred to as R-cr-IJADE, which is an improved version of JADE. In R-cr-IJADE, including the parameter adaptation presented in JADE, the crossover rate repairing technique and the ranking-based mutation are also synergized to improve the performance of JADE when solving the parameter extraction problems of solar cell models. In order to verify the performance of R-cr-IJADE, it is used to extract the parameters of different solar cell models, i.e., single diode, double diode, and PV module. Compared with other parameter extraction techniques, experimental results indicate the superiority of R-cr-IJADE in terms of the quality of final solutions, success rate, and convergence speed. In addition, the simulated data with the extracted parameters of R-cr-IJADE are in very good agreement with the experimental data in all cases. (C) 2013 Elsevier Ltd. All rights reserved.

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作者关键词: Solar cell models; Parameter extraction; Differential evolution; Parameter adaptation; Repairing technique; Ranking-based mutation

KeyWords Plus: I-V CHARACTERISTICS; PHOTOVOLTAIC MODULES; OPTIMIZATION; IDENTIFICATION; ALGORITHM; DIODE

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作者: Hao, F (Hao, Fang); Zou, HY (Zou, Huayao); Lu, YC (Lu, Yongchao)

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摘要: This article reviews the mechanisms of shale gas storage and discusses the major risks or uncertainties for shale gas exploration in China. At a given temperature and pressure, the gas sorption capacities of organic-rich shales are primarily controlled by the organic matter richness but may be significantly influenced by the type and maturity of the organic matter, mineral composition (especially clay content), moisture content, pore volume and structure, resulting in different ratios of gas sorption capacity (GSC) to total organic carbon content for different shales. In laboratory experiments, the GSC of organic-rich shales increases with increasing pressure and decreases with increasing temperature. Under geologic conditions (assuming hydrostatic pressure gradient and constant thermal gradient), the GSC increases initially with depth due to the predominating effect of pressure, passes through a maximum, and then decreases because of the influence of increasing temperature at greater depth. This pattern of variation is quite similar to that observed for coals and is of great significance for understanding the changes in GSC of organic-rich shales over geologic time as a function of burial history. At an elevated temperature and pressure and with the presence of moisture, the gas sorption capacities of organic-rich shales are quite low. As a result, adsorption alone cannot protect sufficient gas for high-maturity organic-rich shales to be commercial gas reservoirs. Two models are proposed to predict the variation of GSC and total gas content over geologic time as a function of burial history. High contents of free gas in organic-rich shales can be preserved in relatively closed systems. Loss of free gas during postgeneration uplift and erosion may result in undersaturation (the total gas contents lower than the sorption capacity) and is the major risk for gas exploration in marine organic-rich shales in China.

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KeyWords Plus: MISSISSIPPIAN BARNETT SHALE; FORT-WORTH BASIN; ORGANIC-MATTER MATURATION; NORTH-CENTRAL TEXAS; BOHAI BAY BASIN; SICHUAN BASIN; PETROLEUM-EXPLORATION; MIGRATION PATHWAYS; SEDIMENTARY BASIN; PORE STRUCTURE

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标题: Adsorption of tetracycline and chloramphenicol in aqueous solutions by bamboo charcoal: A batch and fixed-bed column study

作者: Liao, P (Liao, Peng); Zhan, ZY (Zhan, Zhengyi); Dai, J (Dai, Jing); Wu, XH (Wu, Xiaohui); Zhang, WB (Zhang, Wenbiao); Wang, K (Wang, Kun); Yuan, SH (Yuan, Songhu)

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摘要: Adsorption of two antibiotics, tetracycline (TC) and chloramphenicol (CAP), on a new porous carbonaceous adsorbent, bamboo charcoal (BC), is investigated in batch and fixed bed column experiments. Adsorption isotherms of TC and CAP obtained from batch experiments are better fitted by Freundlich and Dubinin-Radushkevich models compared with Langmuir model. In the fixed bed column experiments, lower bed height, higher flow rate and lower influent contaminant concentration lead to greater adsorption of TC and CAP on BC. A mass transfer model that incorporates both surface and intraparticle diffusion theory into the convection-dispersion equation (CDE) is developed to identify the key process controlling the rate of TC and CAP adsorption. The results demonstrate that the surface diffusion is the rate-limiting step for antibiotics adsorption onto BC, which is consistent with the results of traditional Adams-Bohart model. pi-pi Electro-donor-acceptor (EDA), cation-pi bond in conjunction with hydrogen bonding interaction are the main mechanisms for the adsorption of TC and CAP on BC, while the hydrophobic interaction and electrostatic interaction have minor contributions. (C) 2013 Elsevier B.V. All rights reserved.

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作者关键词: Bamboo charcoal; Antibiotics; Adsorption; Column; Modeling; Mechanism

KeyWords Plus: ACTIVATED CARBON; ORGANIC-CHEMICALS; AQUATIC ENVIRONMENT; PHENOLIC-COMPOUNDS; REMOVAL; ANTIBIOTICS; MECHANISMS; NANOTUBES; SORPTION; STALK

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标题: Metallogeny of the North China Craton: Link with secular changes in the evolving Earth

作者: Zhai, MG (Zhai, Mingguo); Santosh, M (Santosh, M.)

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摘要: The North China Craton (NCC) has experienced a complex geological evolution since the early Precambrian, and carries important records of secular changes in tectonics and metallogeny. Here we synthesize the salient geological and tectonic features of the evolution and destruction of the NCC vis-a-vis major metallogenic events, and the formation of potential ore deposits. We identify a close relationship between the major geological events in the NCC and those reported elsewhere on the globe. We trace the records of a regular change in the pattern of metallogeny, mineral deposit character, spatial distribution and genetic mechanisms, which closely match the timing and styles of the major geological and tectonic events in this craton.

The NCC went through five major tectonic cycles: (1) Neoarchean crustal growth and stabilization, (2) Paleoproterozoic rifting-subduction-accretion-collision with imprints of the Great Oxidation Event (GOE), (3) Late Paleoproterozoic-Neoproterozoic multi-stage rifting, (4) Paleozoic orogenesis at the margins of the craton, and (5) Mesozoic extensional tectonics associated with lithospheric thinning and decratonization. Coinciding with these major geological events are five major metallogenic systems identified as follows: (I) an Archean BIF system, (2) Paleoproterozoic Cu-Pb-Zn and Mg-B systems, (3) a Mesoproterozoic REE-Fe-Pb-Zn system, (4) a Paleozoic orogenic Cu-Mo system, and (5) Mesozoic intracontinental Au and Ag-Pb-Zn and Mo systems. The ore-deposit types in each of these metallogenic systems show distinct characteristics and tectonic affinities. From Early Precambrian through Late Precambrian to Paleozoic and Mesozoic, the NCC records a transition from primitive- to modern-style plate tectonics. Evidence for imbricated oceanic plate stratigraphy in a subduction-accretion setting, and collisional orogenesis along at least three major zones of ocean closure are documented. Major transitions in tectonic style and surface environmental changes recorded in other parts of the world are also reflected in the geological history and metallogenic events in the NCC. Large-scale gold deposits formed through intraplate tectonics during the Mesozoic provide important insights into mantle dynamics and crust-mantle interaction associated with lithospheric thinning and craton destruction. The NCC provides one of the best examples for documenting secular changes in the geological history and metallogenic epochs of an evolving Earth. (C) 2013 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者关键词: Metallogenic events; Tectonics; Geochronology; North China Craton; Evolving Earth

KeyWords Plus: ZIRCON U-PB; JIAODONG GOLD PROVINCE; ASIAN OROGENIC BELT; ORE-FORMING FLUIDS; INNER-MONGOLIA; TECTONIC EVOLUTION; PALEOPROTEROZOIC EVOLUTION; CONTINENTAL-CRUST; IRON-FORMATIONS; HEBEI PROVINCE

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标题: Large-scale fluctuations in Precambrian atmospheric and oceanic oxygen levels from the record of U in shales

作者: Partin, CA (Partin, C. A.); Bekker, A (Bekker, A.); Planavsky, NJ (Planavsky, N. J.); Scott, CT (Scott, C. T.); Gill, BC (Gill, B. C.); Li, C (Li, C.); Podkovyrov, V (Podkovyrov, V.); Maslov, A (Maslov, A.); Konhauser, KO (Konhauser, K. O.); Lalonde, SV (Lalonde, S. V.); Love, GD (Love, G. D.); Poulton, SW (Poulton, S. W.); Lyons, TW (Lyons, T. W.)

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摘要: The atmosphere-ocean system experienced a progressive change from anoxic to more oxidizing conditions through time. This oxidation is traditionally envisaged to have occurred as two stepwise increases in atmospheric oxygen at the beginning and end of the Proterozoic Eon. Here, we present a study of the redox-sensitive element, uranium, in organic-rich shales to track the history of Earth's surface oxidation at an unprecedented temporal resolution. Fluctuations in the degree of uranium enrichment in organic-rich shales suggest that the initial rise of atmospheric oxygen similar to 2.4 billion yr ago was followed by a decline to less oxidizing conditions during the mid-Proterozoic. This redox state persisted for almost 1 billion yr, ending with a second oxygenation event in the latest Neoproterozoic. The U record tracks major fluctuations in surface oxygen level and challenges conventional models that suggest the Earth underwent a unidirectional rise in atmospheric oxygen during the Precambrian. (C) 2013 Elsevier B.V. All rights reserved.

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语言: English

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作者关键词: Precambrian; rise of atmospheric oxygen; ocean; atmosphere; uranium in the ocean

KeyWords Plus: FERRUGINOUS CONDITIONS; TRACE-METALS; NEW-MODEL; URANIUM; OXIDATION; EVOLUTION; RISE; IRON; PALEOREDOX; REDUCTION

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标题: Tectonics of the North Qilian orogen, NW China

作者: Song, SG (Song, Shuguang); Niu, YL (Niu, Yaoling); Su, L (Su, Li); Xia, XH (Xia, Xiaohong)

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摘要: The Qilian Orogen at the northern margin of the Tibetan Plateau is a type suture zone that recorded a complete history from continental breakup to ocean basin evolution, and to the ultimate continental collision in the time period from the Neoproterozoic to the Paleozoic. The Qilian Ocean, often interpreted as representing the "Proto-Tethyan Ocean", may actually be an eastern branch of the worldwide "Iapetus Ocean" between the two continents of Baltica and Laurentia, opened at >= 710 Ma as a consequence of breakup of supercontinent Rodinia.

Initiation of the subduction in the Qilian Ocean probably occurred at similar to 520 Ma with the development of an Andean-type active continental margin represented by infant arc magmatism of similar to 517-490 Ma. In the beginning of Ordovician (similar to 490 Ma), part of the active margin was split from the continental Alashan block and the Andean-type active margin had thus evolved to western Pacific-type trench-arc-back-arc system represented by the MORB-like crust (i.e., SSZ-type ophiolite belt) formed in a back-arc basin setting in the time period of similar to 490-445 Ma. During this time, the subducting oceanic lithosphere underwent LT-HP metamorphism along a cold geotherm of similar to 6-7 degrees C/km.

The Qilian Ocean was closed at the end of the Ordovician (similar to 445 Ma). Continental blocks started to collide and the northern edge of the Qilian-Qaidam block was underthrust/dragged beneath the Alashan block by the downgoing oceanic lithosphere to depths of similar to 100-200 km at about 435-420 Ma. Intensive orogenic activities occurred in the late Silurian and early Devonian in response to the exhumation of the subducted crustal materials.

Briefly, the Qilian Orogen is conceptually a type example of the workings of plate tectonics from continental breakup to the development and evolution of an ocean basin, to the initiation of oceanic subduction and formation of arc and back-arc system, and to the final continental collision/subduction and exhumation. (C) 2012 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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KeyWords Plus: JINCHUAN ULTRAMAFIC INTRUSION; UHP METAMORPHIC BELT; TIBETAN PLATEAU; ALTYN TAGH; SUBDUCTION INITIATION; OCEANIC SUBDUCTION; GARNET PERIDOTITE; PHASE-EQUILIBRIA; HIGH-PRESSURE; SUTURE ZONE

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标题: Tectonic evolution of a composite collision orogen: An overview on the Qinling-Tongbai-Hong'an-Dabie-Sulu orogenic belt in central China

作者: Wu, YB (Wu, Yuan-Bao); Zheng, YF (Zheng, Yong-Fei)

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摘要: The formation of collisional orogens is a prominent feature in convergent plate margins. It is generally a complex process involving multistage tectonism of compression and extension due to continental subduction and collision. The Paleozoic convergence between the South China Block (SCB) and the North China Block (NCB) is associated with a series of tectonic processes such as oceanic subduction, terrane accretion and continental collision, resulting in the Qinling-Tongbai-Hong'an-Dabie-Sulu orogenic belt. While the arc-continent collision orogeny is significant during the Paleozoic in the Qinling-Tongbai-Hong'an orogens of central China, the continent-continent collision orogeny is prominent during the early Mesozoic in the Dabie-Sulu orogens of east-central China. This article presents an overview of regional geology, geochronology and geochemistry for the composite orogenic belt. The Qinling-Tongbai-Hong'an orogens exhibit the early Paleozoic HP-UHP metamorphism, the Carboniferous HP metamorphism and the Paleozoic arc-type magmatism, but the three tectonothermal events are absent in the Dabie-Sulu orogens. The Triassic UHP metamorphism is prominent in the Dabie-Sulu orogens, but it is absent in the Qinling-Tongbai orogens. The Hong'an orogen records both the HP and UHP metamorphism of Triassic age, and collided continental margins contain both the juvenile and ancient crustal rocks. So do in the Qinling and Tongbai orogens. In contrast, only ancient crustal rocks were involved in the UHP metamorphism in the Dabie-Sulu orogenic belt, without involvement of the juvenile arc crust. On the other hand, the deformed and low-grade metamorphosed accretionary wedge was developed on the passive continental margin during subduction in the late Permian to early Triassic along the northern margin of the Dabie-Sulu orogenic belt, and it was developed on the passive oceanic margin during subduction in the early Paleozoic along the northern margin of the Qinling orogen.

Three episodes of arc-continent collision are suggested to occur during the Paleozoic continental convergence between the SCB and NCB. The first episode of arc-continent collision is caused by northward subduction of the North Qinling unit beneath the Erlangping unit, resulting in UHP metamorphism at ca. 480-490 Ma and the accretion of the North Qinling unit to the NCB. The second episode of arc-continent collision is caused by northward subduction of the Prototethyan oceanic crust beneath an Andes-type continental arc, leading to granulite-facies metamorphism at ca. 420-430 Ma and the accretion of the Shangdan arc terrane to the NCB and reworking of the North Qinling, Erlangping and Kuanping units. The third episode of arc-continent collision is caused by northward subduction of the Paleotethyan oceanic crust, resulting in the HP edogite-facies metamorphism at ca. 310 Ma in the Hong'an orogen and low-P metamorphism in the Qinling-Tongbai orogens as well as crustal accretion to the NCB. The closure of backarc basins is also associated with the arc-continent collision processes, with the possible cause for granulite-facies metamorphism. The massive continental subduction of the SCB beneath the NCB took place in the Triassic with the final continent-continent collision and UHP metamorphism at ca. 225-240 Ma. Therefore, the Qinling-Tongbai-Hong'an-Dabie-Sulu orogenic belt records the development of plate tectonics from oceanic subduction and arc-type magmatism to arc-continent and continent-continent collision. (C) 2012 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者: Zhu, DC (Zhu, Di-Cheng); Zhao, ZD (Zhao, Zhi-Dan); Niu, YL (Niu, Yaoling); Dilek, Y (Dilek, Yildirim); Hou, ZQ (Hou, Zeng-Qian); Mo, XX (Mo, Xuan-Xue)

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摘要: Different hypotheses have been proposed for the origin and pre-Cenozoic evolution of the Tibetan Plateau as a result of several collision events between a series of Gondwana-derived terranes (e.g., Qiangtang, Lhasa and India) and Asian continent since the early Paleozoic. This paper reviews and reevaluates these hypotheses in light of new data from Tibet including (1) the distribution of major tectonic boundaries and suture zones, (2) basement rocks and their sedimentary covers, (3) magmatic suites, and (4) detrital zircon constraints from Paleozoic metasedimentary rocks. The Western Qiangtang, Amdo, and Tethyan Himalaya terranes have the Indian Gondwana origin, whereas the Lhasa Terrane shows an Australian Gondwana affinity. The Cambrian magmatic record in the Lhasa Terrane resulted from the subduction of the proto-Tethyan Ocean lithosphere beneath the Australian Gondwana. The newly identified late Devonian granitoids in the southern margin of the Lhasa Terrane may represent an extensional magmatic event associated with its rifting, which ultimately resulted in the opening of the Songdo Tethyan Ocean. The Lhasa-northern Australia collision at similar to 263 Ma was likely responsible for the initiation of a southward-dipping subduction of the Bangong-Nujiang Tethyan Oceanic lithosphere. The Yarlung-Zangbo Tethyan Ocean opened as a back-arc basin in the late Triassic, leading to the separation of the Lhasa Terrane from northern Australia. The subsequent northward subduction of the Yarlung-Zangbo Tethyan Ocean lithosphere beneath the Lhasa Terrane may have been triggered by the Qiangtang-Lhasa collision in the earliest Cretaceous. The mafic dike swarms (ca. 284 Ma) in the Western Qiangtang originated from the Panjal plume activity that resulted in continental rifting and its separation from the northern Indian continent. The subsequent collision of the Western Qiangtang with the Eastern Qiangtang in the middle Triassic was followed by slab breakoff that led to the exhumation of the Qiangtang metamorphic rocks. This collision may have caused the northward subduction initiation of the Bangong-Nujiang Ocean lithosphere beneath the Western Qiangtang. Collision-related coeval igneous rocks occurring on both sides of the suture zone and the within-plate basalt affinity of associated mafic lithologies suggest slab breakoff-induced magmatism in a continent-continent collision zone. This zone may be the site of net continental crust growth, as exemplified by the Tibetan Plateau. (C) 2012 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者: Santosh, M (Santosh, M.); Liu, DY (Liu, Dunyi); Shi, YR (Shi, Yuruo); Liu, SJ (Liu, S. J.)

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摘要: The Inner Mongolia Suture Zone (IMSZ) and the Trans-North China Orogen (TNCO) incorporate the major Paleoproterozoic accretionary orogens in the North China Craton (NCC), with the Jiao-Liao-Ji Belt (JLJB) representing the third one. Here we investigate the Paleoproterozoic tectonics of the IMSZ and TNCO through zircon SHRIMP geochronology on a representative suite of rocks comprising metasediments and arc magmatic rocks. SHRIMP analysis of zircons with textures indicating extreme recrystallization under ultrahigh-temperature (UHT) conditions from the metapelites at Heling'er in the southern domain of the IMSZ reveals a single population with a weighted mean Pb-207/Pb-206 age of 1913 +/- 17 Ma. The zircons in another UHT granulite from this locality yield a weighted mean Pb-207/Pb-206 age of 1910 +/- 18 Ma. These data correlate with the ca. 1.92 Ga age reported from zircons in sapphirine-bearing UHT granulites further north and confirm the regional extent of the Paleoproterozoic UHT metamorphism within the IMSZ. Zircons in a charnockite from the southern margin of the Khondalite Belt fringing the UHT granulites in the IMSZ show two distinct age groups: an older population with a magmatic paragenesis and a weighted mean Pb-207/(206) Pb age of 1932 +/- 24 Ma, and a younger group of metamorphic zircons with an age of 1858 +/- 26 Ma. We also report zircon ages from charnockites in two localities around Xing'he in the Huangtuyao belt belonging to the Huai'an Complex within the westernmost domain of the TNCO at the junction with the IMSZ. The chamockite from first locality carries two distinct zircon populations with the older group yielding a weighted mean Pb-207/Pb-206 age of 2477 +/- 2 Ma and the younger population showing an age of 1807 +/- 38 Ma. The internal structure as revealed from CL images and the overall high Th/U values (up to 2.42) of the older zircons suggest their magmatic affinity, whereas the younger group with extremely low Th/U (0.02-0.09) is of metamorphic origin. Zircons from the charnockite in the second locality also define two distinct age clusters with a dominant older (magmatic) group having a weighted mean Pb-207/Pb-206 age of 2147 +/- 11 Ma and a minor younger group with an age of 1958 +/- 25 Ma. The range of ages from 2477 to 2147 Ma from magmatic zircons in the charnockites from the eastern periphery of the IMSZ, within the western margin of the TNCO, in combination with similar ages reported in recent studies from zircons in magmatic complexes within the IMSZ suggest a prolonged history of subduction-related arc magmatism and accretionary tectonics analogous to those in some of the Phanerozoic belts such as the Central Asian Orogenic Belt and the Western Pacific. Subsequent progressive collision and suturing of the continental blocks were accompanied by the exhumation of high-pressure (HP) and UHT metamorphic rocks. The available data from the IMSZ and TNCO suggest long-lived convergent margins associated with the southward subduction of the Yinshan Block and westward subduction of the Eastern Block in a double-sided subduction realm prior to the final amalgamation of the NCC and its incorporation within the Columbia supercontinent in the late Paleoproterozoic. (C) 2011 Elsevier B.V. All rights reserved.

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作者: Mao, JW (Mao Jingwen); Cheng, YB (Cheng Yanbo); Chen, MH (Chen Maohong); Pirajno, F (Pirajno, Franco)

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摘要: The ore deposits of the Mesozoic age in South China can be divided into three groups, each with different metal associations and spatial distributions and each related to major magmatic events. The first event occurred in the Late Triassic (230-210 Ma), the second in the Mid-Late Jurassic (170-150 Ma), and the third in the Early-Mid Cretaceous (120-80 Ma). The Late Triassic magmatic event and associated mineralization is characterized by peraluminous granite-related W-Sn-Nb-Ta mineral deposits. The Triassic ore deposits are considerably disturbed or overprinted by the later Jurassic and Cretaceous tectono-thermal episodes. The Mid-Late Jurassic magmatic and mineralization events consist of 170-160 Ma porphyry-skarn Cu and Pb-Zn-Ag vein deposits associated with I-type granites and 160-150 Ma metaluminous granite-related polymetallic W-Sn deposits. The Late Jurassic metaluminous granite-related W-Sn deposits occur in a NE-trending cluster in the interior of South China, such as in the Nanling area. In the Early-Mid Cretaceous, from about 120 to 80 Ma, but peaking at 100-90 Ma, subvolcanic-related Fe deposits developed and I-type calc-alkaline granitic intrusions formed porphyry Cu-Mo and porphyry-epithermal Cu-Au-Ag mineral systems, whereas S-type peraluminous and/or metaluminous granitic intrusions formed polymetallic Sn deposits. These Cretaceous mineral deposits cluster in distinct areas and are controlled by pull-apart basins along the South China continental margin. Based on mineral assemblage, age, and space-time distribution of these mineral systems, integrated with regional geological data and field observations, we suggest that the three magmatic-mineralization episodes are the result of distinct geodynamic regimes. The Triassic peraluminous granites and associated W-Sn-Nb-Ta mineralization formed during post-collisional processes involving the South China Block, the North China Craton, and the Indo-China Block, mostly along the Dabie-Sulu and Songma sutures. Jurassic events were initially related to the shallow oblique subduction of the Izanagi plate beneath the Eurasian continent at about 175 Ma, but I-type granitoids with porphyry Cu and vein-type Pb-Zn-Ag deposits only began to form as a result of the breakup of the subducted plate at 170-160 Ma, along the NNE-trending Qinzhou-Hangzhou belt (also referred to as Qin-Hang or Shi-Hang belt), which is the Neoproterozoic suture that amalgamates the Yangtze Craton and Cathaysia Block. A large subduction slab window is assumed to have formed in the Nanling and adjacent areas in the interior of South China, triggering the uprise of asthenospheric mantle into the upper crust and leading to the emplacement of metaluminous granitic magma and associated polymetallic W-Sn mineralization. A relatively tectonically quiet period followed between 150 and 135 Ma in South China. From 135 Ma onward, the angle of convergence of the Izanagi plate changed from oblique to parallel to the coastline, resulting in continental extensional tectonics and reactivation of regional-scale NE-trending faults, such as the Tan-Lu fault. This widespread extension also promoted the development of NE-trending pull-apart basins and metamorphic core complexes, accompanied by volcanism and the formation of epithermal Cu-Au deposits, granite-related polymetallic Sn-(W) deposits and hydrothermal U deposits between 120 and 80 Ma (with a peak activity at 100-90 Ma).

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标题: Regional allocation of CO2 emissions allowance over provinces in China by 2020

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摘要: The mitigation efforts of China are increasingly important for meeting global climate target since the rapid economic growth of China has led to an increasing share in the world's total CO2 emissions. This paper sets out to explore the approach for realizing China's national mitigation targets submitted to the UNFCCC as part of the Copenhagen Accord; that is, to reduce the intensity of CO2 emissions per unit of GDP by 40-45% by 2020, as well as reducing the energy intensity and increasing the share of non-fossil fuel consumption, through regional allocation of emission allowance over China's provinces. Since the realization of China's mitigation target essentially represents a total amount emission allowance allocation problem, an improved zero sum gains data envelopment analysis optimization model, which could deal with the constant total amount resources allocation, is proposed in this study. By utilizing this model and based on several scenarios of China's economic growth, CO2 emissions, and energy consumption, a new efficient emission allowance allocation scheme on provincial level for China by 2020 is proposed. The allocation results indicate that different provinces have to shoulder different mitigation burdens in terms of emission intensity reduction, energy intensity reduction, and share of non-fossil fuels increase. (c) 2012 Elsevier Ltd. All rights reserved.

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摘要: Recently, the computational requirements for large-scale data-intensive analysis of scientific data have grown significantly. In High Energy Physics (HEP) for example, the Large Hadron Collider (LHC) produced 13 petabytes of data in 2010. This huge amount of data is processed on more than 140 computing centers distributed across 34 countries. The MapReduce paradigm has emerged as a highly successful programming model for large-scale data-intensive computing applications. However, current MapReduce implementations are developed to operate on single cluster environments and cannot be leveraged for large-scale distributed data processing across multiple clusters. On the other hand, workflow systems are used for distributed data processing across data centers. It has been reported that the workflow paradigm has some limitations for distributed data processing, such as reliability and efficiency. In this paper, we present the design and implementation of G-Hadoop, a MapReduce framework that aims to enable large-scale distributed computing across multiple clusters. (C) 2012 Elsevier B.V. All rights reserved.

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作者: Wang, H (Wang, Hui); Sun, H (Sun, Hui); Li, CH (Li, Changhe); Rahnamayan, S (Rahnamayan, Shahryar); Pan, JS (Pan, Jeng-shyang)

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摘要: Particle swarm optimization (PSO) has shown an effective performance for solving variant benchmark and real-world optimization problems. However, it suffers from premature convergence because of quick losing of diversity. In order to enhance its performance, this paper proposes a hybrid PSO algorithm, called DNSPSO, which employs a diversity enhancing mechanism and neighborhood search strategies to achieve a trade-off between exploration and exploitation abilities. A comprehensive experimental study is conducted on a set of benchmark functions, including rotated multimodal and shifted high-dimensional problems. Comparison results show that DNSPSO obtains a promising performance on the majority of the test problems. (C) 2012 Elsevier Inc. All rights reserved.

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作者关键词: Particle Swarm Optimization (PSO); Diversity; Neighborhood search; Global optimization

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作者: Sun, WD (Sun, Wei-dong); Liang, HY (Liang, Hua-ying); Ling, MX (Ling, Ming-xing); Zhan, MZ (Zhan, Mei-zhen); Ding, X (Ding, Xing); Zhang, H (Zhang, Hong); Yang, XY (Yang, Xiao-yong); Li, YL (Li, Yi-liang); Ireland, TR (Ireland, Trevor R.); Wei, QR (Wei, Qi-rong); Fan, WM (Fan, Wei-ming)

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摘要: Porphyry copper deposits account for more than 80% of the world's total Cu resources. However, the formation mechanism and controlling factors of porphyry copper deposits remain obscure. Previous studies have revealed that porphyry copper deposits are usually associated with oxidized, calc-alkalic, adakitic shallow intrusive rocks. Here we show that hematite-magnetite intergrowths are commonly found in porphyry copper deposits, suggesting high and fluctuating oxygen fugacity (fO(2)). Oxidation promotes the destruction of sulfides in the magma source, and thereby increases initial chalcophile element concentrations. Sulfide remains undersaturated during the evolution of oxidized sulfur-enriched magmas where sulfate is the dominant sulfur species, leading to high chalcophile element concentrations in evolved magmas. The final porphyry copper mineralization is controlled by sulfate reduction, which starts with magnetite crystallization, accompanied by decreasing pH and correspondingly increasing fO(2). Hematite forms once sulfate reduction lowers the pH sufficiently and the fO(2) reaches the hematite-magnetite oxygen fugacity buffer, which in turn increases the pH for a given fO(2). The oxidation of ferrous iron during the crystallization of magnetite and hematite is the causal process of sulfate reduction and consequent mineralization. Therefore, the initial pH and fO(2) ranges of porphyries favorable for porphyry copper mineralization are defined by the hematite-magnetite oxygen fugacity buffer and SO42--HS--S-3(-) reaction lines. Adakitic rocks have higher initial contents of copper, sulfur and iron than normal arc rocks, and thus are the best candidates for porphyry copper deposits. These provide a plausible explanation for the formation of copper porphyry deposits. The hematite-magnetite intergrowth marks the upper limits of fO(2) favorable for the mineralization, and thus may be a powerful tool for future prospecting of large porphyry copper deposits. (c) 2012 Elsevier Ltd. All rights reserved.

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作者: Cai, YD (Cai, Yidong); Liu, DM (Liu, Dameng); Pan, ZJ (Pan, Zhejun); Yao, YB (Yao, Yanbin); Li, JQ (Li, Junqian); Qiu, YK (Qiu, Yongkai)

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摘要: Adsorption-pore (pore size less than 100 nm) and seepage-pore (pore size greater than 100 nm) structures have great effects on gas adsorption/diffusion and gas flow in coal seam, respectively. Pore properties, including porosity, size/volume distribution, volumes, surface fractals, specific surface area, and connectivity, for four coals from Northeast China were acquired through mercury porosimetry, N-2 adsorption at 77 K, small angle X-ray scattering (SAXS) and their relationships with CH4 adsorption capacity and permeability are investigated. The roughness of pore surface was analyzed with surface fractal dimensions. Obtained values of fractal dimensions from mercury porosimetry and N-2 adsorption at 77 K were comparable with values determined by SAXS measurement. The surface fractals results show that the more irregular surface, the more inhomogeneous pore structures is, meaning more surface area and then stronger adsorption capability, especially for the micropores with sizes in the range of 2-10 nm and the mesopores. Moreover, with the data of petrographic, proximate and ultimate analyses, the ratio of C/H, moisture content, ash yield also have great effects on CH4 adsorption capacity of coals. For bituminous and subbituminous coals, macropores have significant impacts on gas flow. The coals with high contents of macroporosity generally have good gas flow capability. Therefore, they may have significant implications for coalbed methane (CBM) exploitation. (C) 2012 Elsevier Ltd. All rights reserved.

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作者: Song, HJ (Song, Haijun); Wignall, PB (Wignall, Paul B.); Tong, JN (Tong, Jinnan); Yin, HF (Yin, Hongfu)

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摘要: The Permian-Triassic mass extinction is the most severe biotic crisis identified in Earth history. Over 90% of marine species were eliminated(1,2), causing the destruction of the marine ecosystem structure(3). This biotic crisis is generally interpreted as a single extinction event around 252.3 million years ago(2,4-6), and has been variously attributed to the eruption of the Siberian Traps or possibly a bolide impact(7-10). Here we demonstrate that the marine extinction consisted of two pulses, separated by a 180,000-year recovery phase. We evaluated the range of 537 species representing 17 marine groups in seven Chinese sections from a 450,000-year interval spanning the Permian-Triassic boundary. The first stage of extinction occurred during the latest Permian, and was marked by the extinction of 57% of species, namely all plankton and some benthic groups, including algae, rugose corals, and fusulinids. The second phase occurred in the earliest Triassic, and resulted in the extinction of 71% of the remaining species. This second extinction phase fundamentally altered the marine ecosystem structure that had existed for the previous 200 million years. Because the two pulses showed different extinction selectivity, we conclude that they may have had different environmental causes.

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标题: Pre-Rodinia supercontinent Nuna shaping up: A global synthesis with new paleomagnetic results from North China

作者: Zhang, SH (Zhang, Shihong); Li, ZX (Li, Zheng-Xiang); Evans, DAD (Evans, David A. D.); Wu, HC (Wu, Huaichun); Li, HY (Li, Haiyan); Dong, J (Dong, Jin)

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摘要: The existence of a pre-Rodinia Precambrian supercontinent, variously called Nuna or Columbia, has been widely speculated in the past decade, but the precise timing of its existence and its configuration have been uncertain due to the lack of unequivocal paleomagnetic and geological constraints. Here we report high-quality paleomagnetic results from the well dated similar to 1780 Ma Xiong'er Group in southern North China Block (NCB). A total of 110 paleomagnetic samples from 14 sites were collected and subjected to stepwise thermal demagnetization. After removing a low temperature component (CL) of viscous magnetic remanence acquired in recent geomagnetic field, a high temperature component (CH), carried by hematite and magnetite in redbeds and volcanic samples, has been isolated. It gives a mean direction of (D=18.4 degrees, I=-3.7 degrees, alpha(95)=7.6 degrees, N=14) after bedding correction, and a corresponding paleomagnetic pole at 50.2 degrees N, 263.0 degrees E (A(95)=4.5 degrees). The CH passed a reversal test and was interpreted as a primary remanence. This new pole plus three other high-quality poles from the NCB that have been more precisely dated at 1769 +/- 3 Ma, 1560-1440 Ma and 1437 +/- 21 Ma define a 1780-1440 Ma apparent polar wander path (APWP) for the NCB. This, together with an update of global high quality paleomagnetic dataset, allows us to demonstrate that the pre-Rodinia supercontinent Nuna likely existed at least between similar to 1780 Ma and similar to 1400 Ma. Our paleomagnetism-based global reconstruction, for the first time, quantitatively assembles all major cratons together; it encompasses previously proposed regional links including the SAMBA connection between Baltica, Amazonia and Western Africa (Johansson, 2009), connections between Laurentia, Baltica and Siberia at the core of Nuna (Evans and Mitchell, 2011), the proto-SWEAT connection between Laurentia, East Antarctica and Australian blocks (Payne et al., 2009), and the NCB-India connection (Zhao et al., 2011). (C) 2012 Elsevier B.V. All rights reserved.

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作者关键词: paleomagnetism; Xiong'er Group; North China Block; Nuna; supercontinent; reconstruction

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作者: Sun, YD (Sun, Yadong); Joachimski, MM (Joachimski, Michael M.); Wignall, PB (Wignall, Paul B.); Yan, CB (Yan, Chunbo); Chen, YL (Chen, Yanlong); Jiang, HS (Jiang, Haishui); Wang, LN (Wang, Lina); Lai, XL (Lai, Xulong)

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摘要: Global warming is widely regarded to have played a contributing role in numerous past biotic crises. Here, we show that the end-Permian mass extinction coincided with a rapid temperature rise to exceptionally high values in the Early Triassic that were inimical to life in equatorial latitudes and suppressed ecosystem recovery. This was manifested in the loss of calcareous algae, the near-absence of fish in equatorial Tethys, and the dominance of small taxa of invertebrates during the thermal maxima. High temperatures drove most Early Triassic plants and animals out of equatorial terrestrial ecosystems and probably were a major cause of the end-Smithian crisis.

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作者: Zhu, DC (Zhu, Di-Cheng); Zhao, ZD (Zhao, Zhi-Dan); Niu, YL (Niu, Yaoling); Dilek, Y (Dilek, Yildirim); Wang, Q (Wang, Qing); Ji, WH (Ji, Wen-Hua); Dong, GC (Dong, Guo-Chen); Sui, QL (Sui, Qing-Lin); Liu, YS (Liu, Yong-Sheng); Yuan, HL (Yuan, Hong-Lin); Mo, XX (Mo, Xuan-Xue)

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摘要: This paper reports new zircon LA-ICP-MS U-Pb age and Hf-isotope, whole-rock major and trace element, and Sr-Nd isotope data from Cambrian metavolcanic rocks in the central Lhasa subterrane of southern Tibet. These rocks form a bimodal volcanic suite consisting mainly of silicic metavolcanic rocks with subordinate metabasalts. Five silicic metavolcanic samples dated at ca. 492 Ma and one metabasalt sample yielding a near-concordant Pb-206/U-238 age of 492 +/- 4 Ma indicate that mafic and silicic eruptions were contemporaneous. The metabasalts are mostly high-K calc-alkaline, enriched in Th, U, and light rare earth elements (LREEs), and depleted in Nb, Ta, Ti, Zr, and Hf, geochemically resembling the Andean arc basalts. The silicic metavolcanic rocks are high-K calc-alkaline and low in Nb and Zr. The metabasaltic rocks have negative whole-rock epsilon(Nd)(t) values (-4.7 to -3.5) and varying zircon epsilon(Hf)(t) values (-0.7 to +7.5), differing significantly from those of the silicic metavolcanic rocks, which yield negative whole-rock epsilon(Nd)(t) values of -8.4 to -7.2 and varying zircon epsilon(Hf)(t) values (-13.9 to -4.6). The metabasaltic rocks are interpreted as resulting from partial melting of an enriched lithospheric mantle source that was metasomatized by subduction-related components, whereas the silicic metavolcanic rocks were derived from basaltic melt-induced anatexis of the ancient Lhasa basement with inherited mantle melt signatures. The Western Qiangtang-Amdo-Tethyan Himalaya situated in the Indian proto-Tethyan margin and the Lhasa and other possible microcontinents or terranes (e.g., Gongshan, Baoshan, Tengchong, Burma, and Sibumasu) paleographically located in the Australian proto-Tethyan margin represent an early Paleozoic Andean-type magmatic arc facing the proto-Tethyan Ocean. The emplacement of the bimodal volcanic rocks and the development of the Cambro-Ordovician angular unconformity in the central Lhasa subterrane can be attributed to slab break-off of the proto-Tethyan Ocean lithosphere following the collisional accretion of microcontinents or terranes located outboard of the magmatic arc (possibly Eastern Qiangtang and South China). (C) 2012 Elsevier B.V. All rights reserved.

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作者关键词: Whole-rock geochemistry; Zircon U-Pb dating and Hf isotope; Petrogenesis; Cambrian bimodal metavolcanic rocks; Lhasa Terrane; Southern Tibet

KeyWords Plus: U-PB ZIRCON; HF ISOTOPIC CONSTRAINTS; LARGE IGNEOUS PROVINCE; IN-SITU ANALYSIS; A-TYPE GRANITES; TECTONIC EVOLUTION; NORTH CHINA; TRACE-ELEMENT; ISLAND-ARC; PASSIVE MARGIN

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标题: Age constraint on Burmese amber based on U-Pb dating of zircons

作者: Shi, GH (Shi, Guanghai); Grimaldi, DA (Grimaldi, David A.); Harlow, GE (Harlow, George E.); Wang, J (Wang, Jing); Wang, J (Wang, Jun); Yang, MC (Yang, Mengchu); Lei, WY (Lei, Weiyan); Li, QL (Li, Qiuli); Li, XH (Li, Xianhua)

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摘要: Amber from northern Myanmar has been commercially exploited for millennia, and it also preserves the most diverse palaeobiota among the worlds' seven major deposits of Cretaceous amber. Recent estimated ages vary from Albian to Cenomanian, based on palynology, an arnmonoid, and Mesozoic insect taxa preserved within the amber. The burmite-bearing rock is sedimentary and consists mainly of rounded lithic clasts (0.03 similar to 0.15 mm in diameter), with minor fragments of quartz and feldspar. Among the lithic clasts are mostly volcanic rocks. Zircons separated from the amber matrix form two groups: Group-1 zircons are overgrown and have variable CL patterns, experienced slight geological disturbances after they formed, and their Ion microprobe Pb-206/U-238 ages fall into a very narrow range of similar to 102 Ma- similar to 108 Ma; Group-II zircons are typical magmatic ones with rhythmically flat zones, inferred to be derived from volcanic rock clasts, and yielded a concordia Pb-206/U-238 age of 98.79 +/- 0.62 Ma. The dating on Group-1 zircons is only for their interiors, thus hiding what age excursion might come from the overgrowth. Considering the nearshore marine environment and 1-m thickness of the burmite-bearing sediments, and the syn- and post-eruption deposition of volcanic clasts, the age of 98.79 +/- 0.62 Ma therefore can be used as a maximum limit for the burmite (either at or after), establishing an earliest Cenomanian age for the fossilized inclusions. The age also indicates that volcanic eruption occurred at 98.79 +/- 0.62 Ma in the vicinity of the Hukawng Valley. (C) 2012 Elsevier Ltd. All rights reserved.

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标题: Ocean oxygenation in the wake of the Marinoan glaciation

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摘要: Metazoans are likely to have their roots in the Cryogenian period(1-3), but there is a marked increase in the appearance of novel animal and algae fossils shortly after the termination of the late Cryogenian (Marinoan) glaciation about 635 million years ago(4-6). It has been suggested that an oxygenation event in the wake of the severe Marinoan glaciation was the driving factor behind this early diversification of metazoans and the shift in ecosystem complexity(7,8). But there is little evidence for an increase in oceanic or atmospheric oxygen following the Marinoan glaciation, or for a direct link between early animal evolution and redox conditions in general(9). Models linking trends in early biological evolution to shifts in Earth system processes thus remain controversial(10). Here we report geochemical data from early Ediacaran organic-rich black shales (similar to 635-630 million years old) of the basal Doushantuo Formation in South China. High enrichments of molybdenum and vanadium and low pyrite sulphur isotope values (Delta S-34 values >= 65 per mil) in these shales record expansion of the oceanic inventory of redox-sensitive metals and the growth of the marine sulphate reservoir in response to a widely oxygenated ocean. The data provide evidence for an early Ediacaran oxygenation event, which pre-dates the previous estimates for post-Marinoan oxygenation(11-13) by more than 50 million years. Our findings seem to support a link between the most severe glaciations in Earth's history, the oxygenation of the Earth's surface environments, and the earliest diversification of animals.

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标题: The Indus-Yarlung Zangbo ophiolites from Nanga Parbat to Namche Barwa syntaxes, southern Tibet: First synthesis of petrology, geochemistry, and geochronology with incidences on geodynamic reconstructions of Neo-Tethys

作者: Hebert, R (Hebert, R.); Bezard, R (Bezard, R.); Guilmette, C (Guilmette, C.); Dostal, J (Dostal, J.); Wang, CS (Wang, C. S.); Liu, ZF (Liu, Z. F.)

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摘要: The purpose of this first synthesis is to summarize findings on the Yarlung Zangbo Suture Zone (YZSZ) ophiolites and discuss still remaining problems. The YZSZ studied for almost 30 years and is the youngest of the sutures recognized on Tibet Plateau. It is now acknowledged that the YZSZ is a complex assemblage of sedimentary, metamorphic and igneous rocks created during and shortly after the collision between India and Eurasia. The ages of the various lithologies span a time interval from the Jurassic to the Middle Miocene, with some Permian and Devonian exotic blocks from melange zone. The YZSZ is characterized by ophiolitic complexes and ophiolitic melange. The ophiolites are of two types: non dismembered and dismembered sections. The non disturbed sections, although tectonically reworked, are observed along the segment from Dazhuqu to Jiding in Xigaze area and Spontang ophiolite. The dismembered sequences are found in various locations such as Nidar, Kiogar, Jungbwa, Saga, Sangsang, Xigugabu, and Luobusa. The incomplete stratigraphic log could be connected to intraoceanic or orogenetic origins. The ophiolites are distributed into two groups of ages: the Luobusa. Zedang and Kiogar sequences being Jurassic-Lower Cretaceous whereas all other sequences are of Lower Cretaceous age. Compilation of geochronological data suggest that some ophiolite sequences might have evolved for over more than 70 My from their initial genesis to obduction which occurred around 70-90 My ago. Ophiolites differ in terms of petrological and geochemical aspects however, they were all generated in suprasubduction zone and more specifically in arc (few fore-arc) and back-arc settings. Synthesis of more than 700 geochemical analyses show variable mixing of components from N-MORB-type to IAT-CAB and to OIB end-members. The Jurassic ophiolites show the maximum of arc component while the Lower Cretaceous ones show little to strong mixing. In addition, most ophiolites were created in short lived (30 My) basins and generated close to the Eurasiatic continental margin. We propose that Ladakh-Tibet ophiolites were generated in a suprasubduction context similar to Mariana arc, inter-arc and back-arc or Tonga-Lau system. The variable arc signature of these ophiolites is directly related to their initial position within the suprasubduction system. (c) 2011 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者关键词: Ophiolite; Yarlung Zangbo Suture Zone; Suprasubduction; Geodynamics; Tibet

KeyWords Plus: TSANGPO SUTURE ZONE; INDIA-ASIA COLLISION; FORE-ARC BASIN; EAST-WEST EXTENSION; PB ZIRCON AGES; XIGAZE OPHIOLITE; U-PB; NORTHWEST-HIMALAYA; LUOBUSA OPHIOLITE; NW HIMALAYA

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标题: Tunable Blue-Green Color Emission and Energy Transfer of Ca2Al3O6F:Ce3+,Tb3+ Phosphors for Near-UV White LEDs

作者: Xia, ZG (Xia, Zhiguo); Liu, RS (Liu, Ru-Shi)

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摘要: A series of new luminescent emission-tunable phosphors Ca2Al3O6F:Ce3+,Tb3+ have been synthesized by a high temperature solid-state reaction. The UV-vis reflectance, photoluminescence emission and excitation spectra, the lifetime, and the effect of Tb3+ concentration are investigated in detail. The intense green emission is realized in the Ca2Al3O6F:0.08(3+),0.05Tb(3+) phosphors on the basis of the highly efficient energy transfer from Ce3+ to Tb3+ with an efficiency of over 90%. The energy transfer mechanism from Ce3+ to Tb3+ in the Ca2Al3O6F host was ascribed to the exchange interactions, and the formation of the Ce-Ce clusters and Ce-Tb clusters should be the reason for the high energy transfer efficiency. The critical distance of the energy transfer has also been calculated by the concentration-quenching method. These results indicate that the Ca2Al3O6F:Ce3+,Tb3+ phosphors have potential applications as a near UV-convertible phosphor for white light-emitting diodes because of its broad excitation in the near-ultraviolet range and the efficient green emission light.

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作者: Pan, GT (Pan, Guitang); Wang, LQ (Wang, Liquan); Li, RS (Li, Rongshe); Yuan, SH (Yuan, Sihua); Ji, WH (Ji, Wenhua); Yin, FG (Yin, Fuguang); Zhang, WP (Zhang, Wanping); Wang, BD (Wang, Baodi)

来源出版物: JOURNAL OF ASIAN EARTH SCIENCES 卷: 53 特刊: SI 页: 3-14 DOI: 10.1016/j.jseaes.2011.12.018 出版年: JUL 7 2012

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摘要: The Qinghai-Tibet Plateau, composed of several continental slivers within the eastern Tethyan domain, is one of the pivotal sites to examine to better understand the theory of plate tectonics and the orogenic evolution on Earth. This plateau is generally inferred to be a collage of several continental blocks that rifted from Gondwanaland and subsequently accreted to the Asian continent. However, recent recognition of over twenty ophiolite melange zones and their associated island arcs indicates that the traditional model of tectonic evolution requires revision. Based on 177 recently finished 1:250,000 scale geological maps and related studies, we summarize the main tectonic context of the Qinghai-Tibet Plateau and propose a new integrated model to account for the new findings. The complex orogen of the immense Qinghai-Tibet Plateau, consisting of multiple island arc-basin systems that developed at different stages while surrounded by the North China, Yangtze, Tarim, and Indian plates, is emphasized. The entire orogen, surrounded by suture zones that mark the locations of oceanic closure, is investigated by examining (I) the first-order tectonic units and ophiolitic melanges (including arc-arc/continent collision zones) and (II) their internally enclosed blocks as the second-order tectonic units. Therefore, the Qinghai-Tibet Plateau is divided into three major orogenic systems, namely, from northeast to southwest, the Early Paleozoic Qinling-Qilianshan-Kunlunshan (Qin-Qi-Kun), the Late Paleozoic-Triassic Qiangtang-Sanjiang, and the Late Paleozoic to Cenozoic Gangdese-Himalaya orogenic systems, which are separated by the Kangxiwa-Muzitagh-Maqin-Mianxian and the Bangong-Shuanghu-Changning-Menglian sutures, respectively. We propose that the formation and evolution of the Qinghai-Tibet Plateau to have been intrinsically related to those of the eastern Tethys, recorded by the Longmu Co-Shuanghu ophiolite melange zone, the Southern Qiangtang Paleozoic accretionary arc-basin system, the Bangong-Nujiang suture zone, and their associated, composite island arc-basin systems. The present-day Bangong-Shuanghu-Changning-Menglian suture system marks the final closure of the Tethyan Ocean. The Yarlung Zangbo Ocean opened as a back-arc basin in response to the southward subduction of the Tethyan Ocean lithosphere in the Middle Triassic and closed as a result of the India-Asia collision at the end of Cretaceous, followed by the northward indention of the Indian plate that resulted in significant intra-continental deformation and plateau uplift in the Cenozoic. (C) 2012 Elsevier Ltd. All rights reserved.

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作者关键词: Qinghai-Tibet Plateau; Tethyan Ocean; Composite island arc-basin systems; Geological mapping; Tectonic evolution

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标题: Lithium storage in nitrogen-rich mesoporous carbon materials

作者: Mao, Y (Mao, Ya); Duan, H (Duan, Hui); Xu, B (Xu, Bin); Zhang, L (Zhang, Lin); Hu, YS (Hu, Yongsheng); Zhao, CC (Zhao, Changchun); Wang, ZX (Wang, Zhaoxiang); Chen, LQ (Chen, Liquan); Yang, YS (Yang, Yusheng)

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摘要: Nitrogen-rich mesoporous carbon materials were obtained by pyrolyzing gelatin between 700 and 900 degrees C with a nano-CaCO3 template. The mesoporous structure and the high nitrogen content endowed these materials with reversible capacities up to ca. 1200 mA h g (-1). The high specific surface area and the nitrogen doping are responsible for the capacity loss in the initial cycle. FTIR and XPS studies indicate that the nitrogen in the material exists in the form of pyridinic, pyrrolic/pyridonic and graphitic nitrogen. The Raman spectroscopic analysis indicates that the structure of the mesoporous carbon becomes more disordered during discharge and is restored during recharge, a behavior similar to that in nitrogen-free hard carbon materials. The reversible structural variation of these carbon materials ensures their high cyclic reversibility.

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作者: Chen, ZQ (Chen, Zhong-Qiang); Benton, MJ (Benton, Michael J.)

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摘要: The aftermath of the great end-Permian period mass extinction 252 Myr ago shows how life can recover from the loss of >90% species globally. The crisis was triggered by a number of physical environmental shocks (global warming, acid rain, ocean acidification and ocean anoxia), and some of these were repeated over the next 5-6 Myr. Ammonoids and some other groups diversified rapidly, within 1-3 Myr, but extinctions continued through the Early Triassic period. Triassic ecosystems were rebuilt stepwise from low to high trophic levels through the Early to Middle Triassic, and a stable, complex ecosystem did not re-emerge until the beginning of the Middle Triassic, 8-9 Myr after the crisis. A positive aspect of the recovery was the emergence of entirely new groups, such as marine reptiles and decapod crustaceans, as well as new tetrapods on land, including-eventually-dinosaurs. The stepwise recovery of life in the Triassic could have been delayed either by biotic drivers (complex multispecies interactions) or physical perturbations, or a combination of both. This is an example of the wider debate about the relative roles of intrinsic and extrinsic drivers of large-scale evolution.

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KeyWords Plus: PROLONGED ENVIRONMENTAL-STRESS; TRIASSIC BOUNDARY; CARBONATE PLATFORM; ICHNOFOSSIL ASSEMBLAGES; AMMONOID DIVERSITY; GASTROPOD EVIDENCE; BRACHIOPOD FAUNAS; TRACE FOSSILS; AFTERMATH; BIODIVERSITY

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作者: Li, CH (Li, Changhe); Yang, SX (Yang, Shengxiang); Nguyen, TT (Nguyen, Trung Thanh)

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摘要: Particle swarm optimization (PSO) has been shown as an effective tool for solving global optimization problems. So far, most PSO algorithms use a single learning pattern for all particles, which means that all particles in a swarm use the same strategy. This monotonic learning pattern may cause the lack of intelligence for a particular particle, which makes it unable to deal with different complex situations. This paper presents a novel algorithm, called self-learning particle swarm optimizer (SLPSO), for global optimization problems. In SLPSO, each particle has a set of four strategies to cope with different situations in the search space. The cooperation of the four strategies is implemented by an adaptive learning framework at the individual level, which can enable a particle to choose the optimal strategy according to its own local fitness landscape. The experimental study on a set of 45 test functions and two real-world problems show that SLPSO has a superior performance in comparison with several other peer algorithms.

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标题: Comparison of low-field NMR and mercury intrusion porosimetry in characterizing pore size distributions of coals

作者: Yao, YB (Yao, Yanbin); Liu, DM (Liu, Dameng)

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摘要: In this study we investigated how traditional mercury intrusion porosimetry (MIP), constant-ratecontrolled mercury porosimetry (CMP), Low-field NMR spectral analysis (LFNMR), and micro focus computerized tomography (mu CT) compare in revealing the pore size distribution (PSD) characteristics of coals. The comparison was made using the same source samples throughout. Two limitations of mercury porosimetry are addressed. First, the high-pressure intrusion by mercury may either deform or destroy the coal sample and eventually induce suspect value of coal porosity, thus correction of pore structure compressibility must be made in analyzing lignite or other coals that with very open structure. Second, pore shielding effects can induce high uncertainty of MIP results, in particular when clusters of smaller pores occur in isolated domains in a continuous network of larger pores. This can result in temporary mercury entrapment during the extrusion process and result in inaccurate estimations of PSD. Another pore shielding effect is due to isolated clusters of large pores in a continuous network of smaller pores. Her mercury is prone to be trapped permanently. This effect can induce inaccurate estimations of the total pore volume. CMP is an effective method that can provide much more detailed PSD information of macropores, however it is deficient in analyzing mesopores of coals. After comparison with the results by mu CT and other traditional methods, it was found that LFNMR is an efficient tool for nondestructively quantifying the PSD of coal. (C) 2011 Elsevier Ltd. All rights reserved.

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作者关键词: Coal porosity; Pore size distribution; Nuclear magnetic resonance (NMR); Mercury intrusion porosimetry

KeyWords Plus: REMOVAL

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标题: Climate warming in the latest Permian and the Permian-Triassic mass extinction

作者: Joachimski, MM (Joachimski, Michael M.); Lai, XL (Lai, Xulong); Shen, SZ (Shen, Shuzhong); Jiang, HS (Jiang, Haishui); Luo, GM (Luo, Genming); Chen, B (Chen, Bo); Chen, J (Chen, Jun); Sun, YD (Sun, Yadong)

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摘要: High-resolution oxygen isotope records document the timing and magnitude of global warming across the Permian-Triassic (P-Tr) boundary. Oxygen isotope ratios measured on phosphate-bound oxygen in conodont apatite from the Meishan and Shangsi sections (South China) decrease by 2 parts per thousand in the latest Permian, translating into low-latitude surface water warming of 8 degrees C. The oxygen isotope shift coincides with the negative shift in carbon isotope ratios of carbonates, suggesting that the addition of isotopically light carbon to the ocean-atmosphere system by Siberian Traps volcanism and related processes resulted in higher greenhouse gas levels and global warming. The major temperature rise started immediately before the main extinction phase, with maximum and harmful temperatures documented in the latest Permian (Meishan: bed 27). The coincidence of climate warming and the main pulse of extinction suggest that global warming was one of the causes of the collapse of the marine and terrestrial ecosystems. In addition, very warm climate conditions in the Early Triassic may have played a major role in the delayed recovery in the aftermath of the Permian-Triassic crisis.

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标题: Improved in situ Hf isotope ratio analysis of zircon using newly designed X skimmer cone and jet sample cone in combination with the addition of nitrogen by laser ablation multiple collector ICP-MS

作者: Hu, ZC (Hu, Zhaochu); Liu, YS (Liu, Yongsheng); Gao, S (Gao, Shan); Liu, WG (Liu, Wengui); Zhang, W (Zhang, Wen); Tong, XR (Tong, Xirun); Lin, L (Lin, Lin); Zong, KQ (Zong, Keqing); Li, M (Li, Ming); Chen, HH (Chen, Haihong); Zhou, L (Zhou, Lian); Yang, L (Yang, Lu)

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摘要: The effect of three different cone combinations on the performance of laser ablation MC-ICP-MS (Neptune plus) for the in situ Hf isotope analysis of zircon were investigated. The signal sensitivities of Hf, Yb and Lu were improved by a factor of 1.4 and 2.5, respectively, with using the X skimmer cone + standard sampler cone and the X skimmer cone + Jet sample cone compared to the standard arrangement (H skimmer cone + standard sample cone). However, when using the high-sensitivity Jet sample cone, the instrumental mass fractionation for hafnium displayed a large non-linear component that could not be corrected using the normal mass fractionation laws. The magnitude of this non-linear mass fractionation was strongly related to the central gas flow rate. The in situ Hf isotope analysis of zircon standards 91500 and Mud Tank using the Jet cone displayed large deviations (410-470 ppm) at the optimum central gas flow rate for Hf, which seriously deteriorated the performance of the Jet cone. The addition of 4 ml min(-1) nitrogen to the central gas flow in laser ablation MC-ICP-MS was found to not only increase the sensitivity of Hf by a factor of 2.1, but also suppress this non-linear mass fractionation. The determined Yb/Hf and Lu/Hf ratios at their corresponding optimum makeup gas flow rates for Hf intensity were found to be reduced by factors of 2 and 1.3 in the presence of nitrogen, respectively, which would benefit the accurate in situ determination of Hf isotopes in high-content Yb and Lu samples. Compared to the standard arrangement, the corresponding precision (2 sigma) of Hf-176/Hf-177 for single spot analysis of zircon standard 91500 was improved from 224 ppm to 50 ppm by using the newly designed X-skimmer cone and Jet sample cone in combination with the nitrogen addition technique. The determined Hf-176/Hf-177 ratios are in excellent agreement with published values in five reference zircon standards (91500, GJ-1, Mud Tank, Penglai and Plesovice). Our first Hf isotopic results from zircon standard M257 (0.281544 +/- 0.000018; 2SD, n = 151) showed that it was fairly homogeneous in Hf isotopes. These results clearly demonstrate that the present analytical method has the potential to become an important tool for the pursuit of high-quality in situ Hf isotope data for zircons.

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标题: A tectono-genetic model for porphyry-skarn-stratabound Cu-Au-Mo-Fe and magnetite-apatite deposits along the Middle-Lower Yangtze River Valley, Eastern China

作者: Mao, JW (Mao, Jingwen); Xie, GQ (Xie, Guiqing); Duan, C (Duan, Chao); Pirajno, F (Pirajno, Franco); Ishiyama, D (Ishiyama, Dazio); Chen, YC (Chen, Yuchuan)

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摘要: The Middle-Lower Yangtze River Valley metallogenic belt (YRB), situated along the northern margin of the Yangtze craton, is characterized by porphyry-skarn-stratabound Cu-Au-Mo-Fe deposits in the areas of uplift and magnetite-apatite deposits in Cretaceous fault basins. Following detailed field investigations and a review of published data, we recognize two episodes of magmatism and mineralization in the YRB: 1) 156-137 Ma high-K calc-alkaline granitoids associated with 148-135 Maporphyry-skarn-stratabound Cu-Au-Mo-Fe deposits and 2) 135-123 Ma shoshonitic series, associated with 134.9-122.9 Ma magnetite-apatite deposits. A-type granitoids and associated alkaline volcanic have a small age range from 126.5 to 124.8 Ma and are temporally, spatially and genetically associated with the second episode. The geodynamic history of the YRB did not experience the Paleozoic to Mesozoic lithospheric thickening that took place in the North China craton. This process is inferred to be linked to partial melting of the delaminated lower crust at high pressures, resulting in the development of C-type adakitic rocks. The petrochemical and Sr/Nd isotopic data show that both the shoshonitic series and A-type granitoids are quite different from adakites, with only some of the K-calc-alkaline granitoids having adakitic signatures. Previous ore genesis models were established based on an assumed relationship with adakites and a continuous tectono-thermal evolution from 150 to 100 Ma.

All data obtained for the Middle-Lower Yangtze River region consistently show that the Tan-Lu regional strike-slip fault zone, initiated at 233 +/- 6 to 225 +/- 6 Ma from the collision between the North China and Yangtze cratons and was reactivated at ca. 160 Ma The Tan-Lu fault was caused by the oblique subduction of the Izanagi plate, which along the YRB the low-angle subducted slab and the overlying crust was disrupted or broken due to the disharmonious movement of the two blocks. The high-K calc-alkaline granitoids magmas were derived from melting of the subducted slab, with some input of crustal material. These magmas were emplaced at the intersections between NE- and EW-trending faults and formed porphyty-skarn-stratabound Cu-Au-Mo-Fe deposits between 156 and 137 Ma. After 135 Ma the subducted plate changed its direction of motion to northeast, now running parallel to the Eurasian continental margin, and leading to large-scale continental extension. The shoshonitic series and subsequent A-type granitoids magmatism and the development of magnetite-apatite ores in the YRB, took place in both fault basins and NE-trending rifts between 135 and 124 Ma (C) 2011 Elsevier B.V. All rights reserved.

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摘要: Despite decades of research, the roles of climate and humans in driving the dramatic extinctions of large-bodied mammals during the Late Quaternary period remain contentious. Here we use ancient DNA, species distribution models and the human fossil record to elucidate how climate and humans shaped the demographic history of woolly rhinoceros, woolly mammoth, wild horse, reindeer, bison and musk ox. We show that climate has been a major driver of population change over the past 50,000 years. However, each species responds differently to the effects of climatic shifts, habitat redistribution and human encroachment. Although climate change alone can explain the extinction of some species, such as Eurasian musk ox and woolly rhinoceros, a combination of climatic and anthropogenic effects appears to be responsible for the extinction of others, including Eurasian steppe bison and wild horse. We find no genetic signature or any distinctive range dynamics distinguishing extinct from surviving species, emphasizing the challenges associated with predicting future responses of extant mammals to climate and human-mediated habitat change.

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摘要: During the late Cryogenian-Ediacaran (650-542 Ma), the Arabian-Nubian Shield CANS) underwent final assembly and accretion to the Saharan Metacraton concurrent with the assembly of eastern and western Gondwana. At the end of the Precambrian it lay at one end of the East African Orogen, with its northern margin (present coordinates) forming a low-relief stable shelf facing an open ocean; to the south the ANS transitioned into the Mozambique Belt. The geologic history of the ANS during this period provides insight into the closing developmental stages of one of the world's largest accretionary orogens. Following a 680-640 Ma orogenic event reflecting amalgamation of a core grouping of island-arc terranes (the proto-Arabian-Nubian Shield; pANS), the region underwent extensive exhumation, erosion, and subsidence. Depositional basins formed in the northern and eastern pANS, with those in the east below sea level and connected to an ocean. Periodic basin closure and formation of new basins in other parts of the ANS followed. Many basins were filled by terrestrial, molasse-type sediments interfingering with subordinate to predominant amounts of volcanic rocks. Magmatism was extensive throughout the period, initially characterized by tonalite-trondhjemite-granodiorite (TTG) and granite (monzogranite, syenogranite), but also characterized, from similar to 610 Ma on, by increasing amounts of alkali-feldspar granite and alkali granite. The plutons are largely undeformed, except where cut by brittle-ductile shear zones. The magma sources of the late Cryogenian-Ediacaran granitoids were dominated by juvenile crust and(or) depleted mantle and magmas mostly originated in anorogenic, post-collisional, commonly extensional, settings. They were derived by melting and fractionation of anhydrous high-grade metamorphosed lower crust, mafic- to intermediate calc-alkaline crust, and(or) subduction-modified mantle wedges associated with slab break-off or delamination.

By similar to 630 Ma, the region was affected by oblique (transpressional) convergence of continental blocks that formed eastern and western Gondwana the pANS was approaching the Saharan Metacraton; north-trending shear and shortening zones developed in the southern ANS; and northwest-trending strike-slip shear zones of the Najd fault system dominated farther north. In the northwestern ANS, convergence and Najd transpression buckled the crust causing structural highs with domes of gneissic infracrust overlain by supracrust composed of ophiolitic and volcanosedimentary assemblages dating from the Tonian-middle Cryogenian period of island-arc activity. The supracrust was extensively translated to the northwest above a high-strain zone. Extension and tectonic escape augmented exhumation of the gneissic infracrust particularly between similar to 620-580 Ma. In the northeastern ANS, linear belts of gneiss formed from reworked older intrusive bodies or syntectonic intrusions that were emplaced along Najd faults. By similar to 620 Ma a marine basin on the eastern margin of the pANS (present coordinates) was beginning to close. A thick sedimentary assemblage (Abt formation) in this basin underwent metamorphism and folding, and subduction-related magmatism and volcanism farther into this basin (Al Amar arc; >690-615 Ma) was coming to an end. Amalgamation of the Abt formation, Al Amar arc, and the pANS occurred between similar to 620 and similar to 605 Ma, and terminal collision between the pANS and the Saharan Metacraton was complete by similar to 580 Ma. At this time, the ANS was fully assembled. Granite magmatism continued until similar to 565-560 Ma and orogeny ceased by similar to 550 Ma. During these terminal events, the region underwent strong chemical weathering and became a vast low-relief surface on which Lower Paleozoic sandstone was eventually deposited. (C) 2011 Elsevier Ltd. All rights reserved.

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The review represents a major international collaboration among authors whose work in the ANS spans three decades. The views expressed are based on an extensive body of literature, insights developed during prolonged periods of field work, and understanding gained from discussions with colleagues, but are ultimately those of the authors and are presented here as a summary of their present interpretations and a stimulus to further research. This review is a JEBEL contribution: R.J.S., A.A., and P.R.J. acknowledge the JEBEL Project as a means of bringing them together in the field, and providing a venue for gathering new information and exchanging ideas. Support for R.J.S. and P.R.J. to participate in the meeting was provided by NSF Grant 08221257. P.R.J. thanks Dr. Zohair Nawab, President, and colleagues at the Saudi Geological Survey for the opportunity to work on the Arabian Shield. A.A. acknowledges with thanks the staff and faculty at the Geology Department, Assiut University, particularly Dr. M.M.A. Abu El-Rus and Dr. E.M.S. El-Gaby, for exposing him to the geology, history, and problems of the Eastern Desert of Egypt. A.S.C's contribution forms TRaX Record #164. H.F. thanks the Austrian Science Foundation for financial support of a number of grants related to African geology (P12375, P09703, P15599, P12836, T247-N10) and colleagues at the Universities of Assuit and Mansour, Egypt. Funds for T.K. were provided by the National Natural Science Foundation of China (Grants 91014992 and 40821061) and the Ministry of Education of China (B07039). We thank Mohammed Abdelsalam and an anonymous reviewer for valuable comments that improved our final text, and acknowledge the Elsevier Press, the Journal of African Earth Sciences, and Tim Horscroft (editor) for the invitation to contribute this review.

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摘要: The chemical composition of the ocean changed markedly with the oxidation of the Earth's surface(1), and this process has profoundly influenced the evolutionary and ecological history of life(2,3). The early Earth was characterized by a reducing ocean-atmosphere system, whereas the Phanerozoic eon (less than 542 million years ago) is known for a stable and oxygenated biosphere conducive to the radiation of animals. The redox characteristics of surface environments during Earth's middle age (1.8-1 billion years ago) are less well known, but it is generally assumed that the mid-Proterozoic was home to a globally sulphidic (euxinic) deep ocean(2,3). Here we present iron data from a suite of mid-Proterozoic marine mudstones. Contrary to the popular model, our results indicate that ferruginous (anoxic and Fe2+-rich) conditions were both spatially and temporally extensive across diverse palaeogeographic settings in the mid-Proterozoic ocean, inviting new models for the temporal distribution of iron formations and the availability of bioessential trace elements during a critical window for eukaryotic evolution.

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标题: Lhasa terrane in southern Tibet came from Australia

作者: Zhu, DC (Zhu, Di-Cheng); Zhao, ZD (Zhao, Zhi-Dan); Niu, YL (Niu, Yaoling); Dilek, Y (Dilek, Yildirim); Mo, XX (Mo, Xuan-Xue)

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摘要: The U-Pb age and Hf isotope data on detrital zircons from Paleozoic metasedimentary rocks in the Lhasa terrane (Tibet) define a distinctive age population of ca. 1170 Ma with epsilon(Hf)(t) values identical to the coeval detrital zircons from Western Australia, but those from the western Qiangtang and Tethyan Himalaya terranes define an age population of ca. 950 Ma with a similar epsilon(Hf)(t) range. The ca. 1170 Ma detrital zircons in the Lhasa terrane were most likely derived from the Albany-Fraser belt in southwest Australia, whereas the ca. 950 Ma detrital zircons from both the western Qiangtang and Tethyan Himalaya terranes might have been sourced from the High Himalaya to the south. Such detrital zircon connections enable us to propose that the Lhasa terrane is exotic to the Tibetan Plateau system, and should no longer be considered as part of the Qiangtang-Greater India-Tethyan Himalaya continental margin system in the Paleozoic reconstruction of the Indian plate, as current models show; rather, it should be placed at the northwestern margin of Australia. These results provide new constraints on the paleogeographic reconstruction and tectonic evolution of southern Tibet, and indicate that the Lhasa terrane evolved as part of the late Precambrian-early Paleozoic evolution as part of Australia in a different paleogeographical setting than that of the Qiangtang-Greater India-Tethyan Himalaya system.

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标题: Monitoring lake level changes on the Tibetan Plateau using ICESat altimetry data (2003-2009)

作者: Zhang, GQ (Zhang, Guoqing); Xie, HJ (Xie, Hongjie); Kang, SC (Kang, Shichang); Yi, DH (Yi, Donghui); Ackley, SF (Ackley, Stephen F.)

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摘要: In this study. ICESat altimetry data are used to provide precise lake elevations of the Tibetan Plateau (IF) during the period of 2003-2009. Among the 261 lakes examined ICESat data are available on 111 lakes: 74 lakes with ICESat footprints for 4-7 years and 37 lakes with footprints for 1-3 years. This is the first time that precise lake elevation data are provided for the 111 lakes. Those ICESat elevation data can be used as baselines for future changes in lake levels as well as for changes during the 2003-2009 period. It is found that in the 74 lakes (56 salt lakes) examined, 62 (i.e. 84%) of all lakes and 50 (i.e. 89%) of the salt lakes show tendency of lake level increase. The mean lake water level increase rate is 0.23 m/year for the 56 salt lakes and 0.27 m/year for the 50 salt lakes of water level increase. The largest lake level increase rate (0.80 m/year) found in this study is the lake Cedo Caka. The 74 lakes are grouped into four subareas based on geographical locations and change tendencies in lake levels. Three of the four subareas show increased lake levels. The mean lake level change rates for subareas I, II, III, IV, and the entire TP are 0.12, 0.26, 0.19, -0.11, and 0.2 m/year, respectively. These recent increases in lake level, particularly for a high percentage of salt lakes, supports accelerated glacier melting due to global warming as the most likely cause. (C) 2011 Elsevier Inc. All rights reserved.

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作者关键词: Tibetan Plateau; Lake level; ICESat; Salt lake; Glacier melting

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作者: Kusky, TM (Kusky, Timothy M.)

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摘要: The geometry and timing of amalgamation of the North China Craton have been controversial, with three main models offering significantly different interpretations of regional structure, geochronology, and geological relationships. One model suggests that the Eastern and Western Blocks of the NCC formed separately in the Archean, and an active margin was developed on the Eastern Block between 2.5 and 1.85 Ga, when the two blocks collided above an east-dipping subduction zone. A second presumes the Eastern Block rifted from an unknown larger continent at circa 2.7 Ga, and experienced a collision with an arc (perhaps attached to the western block) above a west-dipping subduction zone at 2.5 Ga, and the 1.85 Ga metamorphism is related to a collision along the northern margin of the craton when the NCC joined the Columbia supercontinent. A third model suggests two collisions in the Central Orogenic Belt, at 2.1 and 1.88 Ga, but recognizes an early undated deformation event. Recent seismic results reveal details of the deep crustal and lithospheric structure that support both the second and third models, showing that subduction beneath the Central Orogenic Belt was west-directed, and that there is a second, west-dipping paleosubduction zone located to the east of the COB dipping beneath the Western Block (Ordos Craton). The boundaries identified through geophysics do not correlate with the boundaries of the Trans-North China Orogen suggested in the first model, and the subduction polarity is opposite that predicted by that model. High-pressure granulite facies metamorphism at 1.85 Ga is not restricted to the "TNCO" as suggested by the first model, but is documented across the NCC, as predicted by the second model, suggesting a major continent-continent collision along the north margin of the craton at 1.85 Ga. Further, it has recently been shown that in the southern "TNCO", there is no record of metamorphism at circa 1.85 Ga, but only at 2.7-2.5 Ga, showing that the "TNCO", as defined as a circa 1.85 Ga orogen, does not exist. This is further confirmed by recent Re-Os isotopic studies which show that the subcontinental lithospheric mantle beneath the southern COB is late Archean in age, and that a province in the northern NCC is circa 1.8 Ga, correlating with the proposed collision belt of the NCC with the Columbia supercontinent across the entire NCC. The COB is an Archean convergent belt, re-worked in the Paleoproterozoic, and the Paleoproterozoic tectonism is widespread across the NCC, as predicted by the model whereby the previously amalgamated Eastern and Western Blocks experienced a continental collision with Columbia at circa 1.85 Ga, but uplift/exhumation rates are slow, necessitating a re-evaluation of the tectonic models of the NCC. (C) 2011 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者: Jiang, GQ (Jiang, Ganqing); Shi, XY (Shi, Xiaoying); Zhang, SH (Zhang, Shihong); Wang, Y (Wang, Yue); Xiao, SH (Xiao, Shuhai)

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摘要: The Ediacaran Doushantuo Formation (ca. 635-551 Ma) in South China contains exceptionally well-preserved fossils of multicellular eukaryotes including early animals, and it is one of the most intensively investigated Ediacaran units in the world. Various stratigraphic methods including litho-, chemo-, bio-, and sequence-stratigraphy have been applied to establish a stratigraphic framework for the Doushantuo Formation, but so far regional correlation across the basin relies heavily on two distinctive marker beds, the cap carbonate at the base and the organic-rich black shale at the top of the Doushantuo Formation. The majority of the Doushantuo Formation in the Yangtze platform was deposited on a rimmed carbonate shelf, with a shelf margin shoal complex that restricted the shelf lagoon from the open ocean. Large facies variations are observed in the shallow margins of the shelf lagoon and in the shelf margin-to-slope transition, where depositional environments were near the chemocline of the stratified, anoxic/euxinic shelf lagoon and of the broader Nanhua basin, respectively. Chemocline instability in the shelf lagoon and in the Nanhua basin caused local geochemical cycling, resulting in significant variations in carbon and sulfur isotopes and in redox-sensitive elemental concentrations. Most benthic eukaryotic fossils (including animal fossils) of the Doushantuo Formation have been found from the shallow margins of the shelf lagoon and from the shelf margin-slope transition, but rarely from deep-water environments that may have been below the chemocline for most of the Doushantuo time, implying the sensitivity of eukaryotes to paleogeographically controlled chemocline fluctuations. (C) 2011 International Association for Gondwana Research. Published by Elsevier B.V. All rights reserved.

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作者: Zhu, RX (Zhu RiXiang); Chen, L (Chen Ling); Wu, FY (Wu FuYuan); Liu, JL (Liu JunLai)

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摘要: The North China Craton (NCC) is a classical example of ancient destroyed cratons. Since the initiation of the North China Craton Destruction Project by the National Natural Science Foundation of China, numerous studies have been conducted on the timing, scale, and mechanism of this destruction through combined interdisciplinary research. Available data suggest that the destruction occurred mainly in the eastern NCC, whereas the western NCC was only locally modified. The sedimentation, magmatic activities and structural deformation after cratonization at similar to 1.8 Ga indicate that the NCC destruction took place in the Mesozoic with a peak age of ca 125 Ma. A global comparison suggests that most cratons on Earth are not destroyed, although they have commonly experienced lithospheric thinning; destruction is likely to occur only when the craton has been disturbed by oceanic subduction. The destruction of the NCC was coincident with globally active plate tectonics and high mantle temperatures during the Cretaceous. The subducted Pacific slab destabilized mantle convection beneath the eastern NCC, which resulted in cratonic destruction in the eastern NCC. Delamination and/or thermal-mechanical-chemical erosion resulted from the destabilization of mantle convection.

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作者关键词: timing; scale and mechanism; craton destruction; North China Craton

KeyWords Plus: METAMORPHIC CORE COMPLEX; LITHOSPHERIC THICKNESS; CONTINENTAL-CRUST; STRUCTURE BENEATH; MANTLE BENEATH; EASTERN CHINA; GEOCHEMISTRY; EXTENSION; EVOLUTION; XENOLITHS

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作者: Gong, WY (Gong, Wenyin); Cai, ZH (Cai, Zhihua); Ling, CX (Ling, Charles X.)

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摘要: Differential evolution (DE) is a fast and robust evolutionary algorithm for global optimization. It has been widely used in many areas. Biogeography-based optimization (BBO) is a new biogeography inspired algorithm. It mainly uses the biogeography-based migration operator to share the information among solutions. In this paper, we propose a hybrid DE with BBO, namely DE/BBO, for the global numerical optimization problem. DE/BBO combines the exploration of DE with the exploitation of BBO effectively, and hence it can generate the promising candidate solutions. To verify the performance of our proposed DE/BBO, 23 benchmark functions with a wide range of dimensions and diverse complexities are employed. Experimental results indicate that our approach is effective and efficient. Compared with other state-of-the-art DE approaches, DE/BBO performs better, or at least comparably, in terms of the quality of the final solutions and the convergence rate. In addition, the influence of the population size, dimensionality, different mutation schemes, and the self-adaptive control parameters of DE are also studied.

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标题: Reappraisal of the ages of Neoproterozoic strata in South China: No connection with the Grenvillian orogeny

作者: Zhao, JH (Zhao, Jun-Hong); Zhou, MF (Zhou, Mei-Fu); Yan, DP (Yan, Dan-Ping); Zheng, JP (Zheng, Jian-Ping); Li, JW (Li, Jian-Wei)

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摘要: The Jiangnan fold belt separates the Yangtze and Cathaysia blocks in South China and has long been considered Grenvillian in age in order to place South China in central Rodinia. It consists of deformed Early Neoproterozoic strata that are unconformably overlain by undeformed Late Neoproterozoic strata and intruded by undeformed and unmetamorphosed granitic plutons. Zircons from the Early Neoproterozoic strata yield U-Pb ages as young as 830 Ma, and one granitic pluton has a zircon U-Pb age of ca. 827 Ma. The >= 830 Ma mafic rocks along the southeastern margin of the Yangtze block have arc-affinity geochemical characters, whereas mafic rocks younger than 830 Ma have typical ocean island basalt (OIB)-like compositions. Thus, we suggest that the Early Neoproterozoic strata were deposited on an active continental margin prior to amalgamation of the Yangtze and Cathaysia blocks at ca. 830 Ma. The overlying Late Neoproterozoic strata were deposited in the intracontinental rifted Nanhua Basin at 820-730 Ma and probably reflect backarc spreading above the long-lived (950-735 Ma) oceanic subduction zone along the northern and western margin of the Yangtze block. This model is consistent with the secular tectonic evolution of South China during the Neoproterozoic. The Jiangnan fold belt is therefore not a Grenvillian feature as previously suggested, and there is no evidence to place South China in central Rodinia. Instead, we believe that South China was located in a marginal position relative to this supercontinent.

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语言: English

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KeyWords Plus: GEOCHEMICAL EVIDENCE; YANGTZE BLOCK; MANTLE PLUME; CATHAYSIA BLOCKS; JIANGNAN OROGEN; VOLCANIC-ROCKS; BREAK-UP; RODINIA; MAGMATISM; MA

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标题: Ophiolite genesis and global tectonics: Geochemical and tectonic fingerprinting of ancient oceanic lithosphere

作者: Dilek, Y (Dilek, Yildirim); Furnes, H (Furnes, Harald)

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摘要: Ophiolites, and discussions on their origin and significance in Earth's history, have been instrumental in the formulation, testing, and establishment of hypotheses and theories in earth sciences. The definition, tectonic origin, and emplacement mechanisms of ophiolites have been the subject of a dynamic and continually evolving concept since the nineteenth century. Here, we present a review of these ideas as well as a new classification of ophiolites, incorporating the diversity in their structural architecture and geochemical signatures that results from variations in petrological, geochemical, and tectonic processes during formation in different geodynamic settings. We define ophiolites as suites of temporally and spatially associated ultramafic to felsic rocks related to separate melting episodes and processes of magmatic differentiation in particular tectonic environments. Their geochemical characteristics, internal structure, and thickness vary with spreading rate, proximity to plumes or trenches, mantle temperature, mantle fertility, and the availability of fluids. Subduction-related ophiolites include suprasubduction-zone and volcanic-arc types, the evolution of which is governed by slab dehydration and accompanying metasomatism of the mantle, melting of the subducting sediments, and repeated episodes of partial melting of metasomatized peridotites. Subduction-unrelated ophiolites include continental-margin, midocean-ridge (plume-proximal, plume-distal, and trench-distal), and plume-type (plumeproximal ridge and oceanic plateau) ophiolites that generally have mid-ocean-ridge basalt (MORB) compositions. Subduction-related lithosphere and ophiolites develop during the closure of ocean basins, whereas subduction-unrelated types evolve during rift drift and seafloor spreading. The peak times of ophiolite genesis and emplacement in Earth history coincided with collisional events leading to the construction of supercontinents, continental breakup, and plume-related supermagmatic events. Geochemical and tectonic fingerprinting of Phanerozoic ophiolites within the framework of this new ophiolite classification is an effective tool for identification of the geodynamic settings of oceanic crust formation in Earth history, and it can be extended into Precambrian green-stone belts in order to investigate the ways in which oceanic crust formed in the Archean.

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标题: AGE AND GROWTH OF THE ARCHEAN KONGLING TERRAIN, SOUTH CHINA, WITH EMPHASIS ON 3.3 GA GRANITOID GNEISSES

作者: Gao, S (Gao, Shan); Yang, J (Yang, Jie); Zhou, L (Zhou, Lian); Li, M (Li, Ming); Hu, ZC (Hu, Zhaochu); Guo, JL (Guo, Jingliang); Yuan, HL (Yuan, Honglin); Gong, HJ (Gong, Hujun); Xiao, GQ (Xiao, Gaoqiang); Wei, JQ (Wei, Junqi)

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摘要: The North China craton and the Yangtze craton (South China) both contain Archean rocks in eastern China. Unlike the North China craton, where Archean rocks are widespread, in the Yangtze craton the exposed Archean rocks are only known in the Kongling terrain (360 km(2)). Zircon U-Pb ages and Lu-Hf isotopic compositions of three granodioritic-trondhjemitic gneisses and three metasedimentary rocks from the Kongling terrain were analyzed by LA-ICP-MS and LA-MC-ICP-MS. Igneous zircons in one trondhjemitic gneiss in the north of the Kongling terrain have an age of 3302 +/- 7 (1 sigma) Ma. Evidence from cathodoluminescence imaging, variations in Th/U and degree of U-Pb age discordance suggest that apparently younger zircons in the same population are variably disturbed 3302 Ma grains. Thus, this trondhjemitic gneiss is the oldest known rock in South China and predates the earlier reported similar to 2900 Ma granitoid magmatism by 400 Ma. Zircon cores from one granodioritic gneiss in the north of the Kongling terrain also give a concordant age group at 3200 to 3300 Ma. Regardless as inherited or not, these cores crystallized from a magma indistinguishable in age with the trondhjemite. Concordant U-Pb ages for igneous zircons in one granodioritic gneiss in the south of the Kongling terrain yielded a weighted average (206)pb/(207)pb age of 2981 +/- 13 Ma (2 sigma, MSWD=9.7, n=21). The zircon age and initial Hf isotopic compositions are similar to those of widespread granitoid gneisses from the north of the Kongling terrain (2903-2947 Ma), and indicate that the south and north of the Kongling terrain are correlative. The results also reinforce that magmatism of the whole Kongling terrain mainly occurred at 2900 Ma.

Available Hf isotopic data from the Kongling terrain show that juvenile crustal additions occurred mainly between 3150 and 3800 Ma with a significant peak at 3300 to 3500 Ma. The similar to 3300 Ma zircons from the trondhjemitic gneiss have Hf crust formation ages of 3450 to 3730 Ma, some of which have nearly chondritic epsilon(Hf) (t). The whole-rock depleted mantle Nd model age of this rock is 3400 Ma, close to its age of magmatism and consistent with the Hf model age. Its epsilon(Nd) value at 3300 Ma is nearly chondritic (1.26). These lines of evidence suggest that the 3300 Ma trondhjemite represent juvenile crust additions to the pre-existing continental crust.

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作者关键词: Archean; TTG; crustal growth; Yangtze craton; South China

KeyWords Plus: U-PB AGE; EPISODIC CONTINENTAL GROWTH; PLASMA-MASS SPECTROMETRY; IN-SITU HF; YANGTZE CRATON; ISOTOPE EVIDENCE; TRACE-ELEMENT; NORTH CHINA; DETRITAL ZIRCONS; OXYGEN ISOTOPES

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标题: The Lhasa Terrane: Record of a microcontinent and its histories of drift and growth

作者: Zhu, DC (Zhu, Di-Cheng); Zhao, ZD (Zhao, Zihi-Dan); Niu, YL (Niu, Yaoling); Mo, XX (Mo, Xuan-Xue); Chung, SL (Chung, Sun-Lin); Hou, ZQ (Hou, Zeng-Qian); Wang, LQ (Wang, Li-Quan); Wu, FY (Wu, Fu-Yuan)

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摘要: The Lhasa Terrane in southern Tibet has long been accepted as the last geological block accreted to Eurasia before its collision with the northward drifting Indian continent in the Cenozoic, but its lithospheric architecture, drift and growth histories and the nature of its northern suture with Eurasia via the Qiangtang Terrane remain enigmatic. Using zircon in situ U-Pb and Lu-Hf isotopic and bulk-rock geochemical data of Mesozoic-Early Tertiary magmatic rocks sampled along four north-south traverses across the Lhasa Terrane, we show that the Lhasa Terrane has ancient basement rocks of Proterozoic and Archean ages (up to 2870 Ma) in its centre with younger and juvenile crust (Phanerozoic) accreted towards its both northern and southern edges. This finding proves that the central Lhasa subterrane was once a microcontinent. This continent has survived from its long journey across the Paleo-Tethyan Ocean basins and has grown at the edges through magmatism resulting from oceanic lithosphere subduction towards beneath it during its journey and subsequent collisions with the Qiangtang Terrane to the north and with the Indian continent to the south. Zircon Hf isotope data indicate significant mantle source contributions to the generation of these granitoid rocks (e.g., similar to 50-90%, 0-70%, and 30-100% to the Mesozoic magmatism in the southern, central, and northern Lhasa subterranes, respectively). We suggest that much of the Mesozoic magmatism in the Lhasa Terrane may be associated with the southward Bangong-Nujiang Tethyan seafloor subduction beneath the Lhasa Terrane, which likely began in the Middle Permian (or earlier) and ceased in the late Early Cretaceous, and that the significant changes of zircon epsilon(Hf)(t) at similar to 113 and similar to 52 Ma record tectonomagmatic activities as a result of slab break-off and related mantle melting events following the Qiangtang-Lhasa amalgamation and India-Lhasa amalgamation, respectively. These results manifest the efficacy of zircons as a chronometer (U-Pb dating) and a geochemical tracer (Hf isotopes) in understanding the origin and histories of lithospheric plates and in revealing the tectonic evolution of old orogenies in the context of plate tectonics. (C) 2010 Elsevier B.V. All rights reserved.

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KeyWords Plus: ZIRCON U-PB; INDIA-ASIA COLLISION; ADAKITE-LIKE ROCKS; IN-SITU ANALYSIS; HF ISOTOPIC DATA; SOUTHERN TIBET; TECTONIC EVOLUTION; GANGDESE BATHOLITH; VOLCANIC-ROCKS; CONTINENTAL-CRUST

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**热点论文：**

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标题: Implications of the in situ stress distribution for coalbed methane zonation and hydraulic fracturing in multiple seams, western Guizhou, China

作者: Chen, SD (Chen, Shida); Tang, DZ (Tang, Dazhen); Tao, S (Tao, Shu); Liu, PC (Liu, Pengcheng); Mathews, JP (Mathews, Jonathan P.)

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摘要: With 59 sets of well testing data from 32 wells, 70 coal seam gas data from 9 wells, and production data from 17 wells, the in situ stress distribution within depths of 136-1244 m and its implications for coal permeability (0.0001-1.56 mD), gas content (5-22 m3/t) and gas productivity in western Guizhou were investigated. Three major depth intervals with different stress regimes were identified. At depths of 800-1244 m, the horizontal stresses increased to high values with depth due to the compressional zone near the axis of the syncline. Permeability changes with depth were consistent with the effective stress variations. The 500-800 m depth interval with a normal faulting stress regime was favorable for good permeability (0.008-0.57 mD, mean 0.2 mD) and a stable pressure gradient (approximately 1 MPa/100 m), and the gas content generally increased with depth to a peak value at 800 m. For the 200-500 m and 800-1244 m depth intervals, extremely low permeability (0.0001-0.17 mD, mean 0.03 mD) resulted in discontinuous changes in gas content and pressure gradient (0.471.71 MPa/100 m). Overall, the stress release zone at depths of 500-800 m was favorable for coalbed methane extraction, which agreed with the measured production data. Low horizontal stress anisotropy in western Guizhou contributes to complex hydraulic fracture networks, individual seam fracturing with low proppant concentration and high fracturing fluid volume is suggested for multilayer commingled production.

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KeyWords Plus: DEPENDENT PERMEABILITY; LABORATORY MEASUREMENT; SEDIMENTARY CONTROL; HORIZONTAL STRESS; CBM DEVELOPMENT; BEARING SYSTEM; PORE PRESSURE; ORDOS BASIN; RESERVOIR; PROVINCE

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标题: Recent advances on Bi2WO6-based photocatalysts for environmental and energy applications

作者: Chen, T (Chen, Tong); Liu, LZ (Liu, Lizhen); Hu, C (Hu, Cheng); Huang, HW (Huang, Hongwei)

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摘要: Bismuth tungstate (Bi2WO6) has become a research hotspot due to its potential in photocatalytic energy conversion and environmental purification. Nevertheless, the limited light absorption and fast recombination of photogenerated carriers hinder the further improvement of the photocatalytic performance of Bi2WO6. Herein, we provide a systematic review for the recent advances on Bi2WO6-based photocatalysts. It starts with the crystal structure, optical properties and photocatalytic fundamentals of Bi2WO6. Then, we focus on the modification strategies of Bi2WO6 based on morphology control, atomic modulation and composite fabrication for diverse photocatalytic applications, such as organic synthesis, water splitting, CO2 reduction, water treatment, air purification, bacterial inactivation, etc. Finally, some current challenges and future development prospects are proposed. We expect that this review can provide a useful reference and guidance for the development of efficient Bi2WO6 photocatalysts. (C) 2021, Dalian Institute of Chemical Physics, Chinese Academy of Sciences. Published by Elsevier B.V. All rights reserved.

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摘要: More than 2.5 billion people on the globe rely on groundwater for drinking and providing high-quality drinking water has become one of the major challenges of human society. Although groundwater is considered as safe, high concentrations of heavy metals like arsenic (As) can pose potential human health concerns and hazards. In this paper, we present an overviewof the current scenario of arsenic contamination of groundwater in various countries across the globe with an emphasis on the Indian Peninsula. With several newly affected regions reported during the last decade, a significant increase has been observed in the global scenario of arsenic contamination. It is estimated that nearly 108 countries are affected by arsenic contamination in groundwater (with concentration beyond maximum permissible limit of 10 ppb recommended by theWorld Health Organization. The highest among these are from Asia (32) and Europe (31), followed by regions like Africa (20), North America (11), South America (9) and Australia (4). More than 230 million people worldwide, which include 180 million from Asia, are at risk of arsenic poisoning. Southeast Asian countries, Bangladesh, India, Pakistan, China, Nepal, Vietnam, Burma, Thailand and Cambodia, are the most affected. In India, 20 states and 4 Union Territories have so far been affected by arsenic contamination in groundwater. An attempt to evaluate the correlation between arsenic poisoning and aquifer type shows that the groundwater extracted from unconsolidated sedimentary aquifers, particularly those which are located within the younger orogenic belts of the world, are theworst affected. More than 90% of arsenic pollution is inferred to be geogenic. We infer that alluvial sediments are the major source for arsenic contamination in groundwater andwe postulate a strong relation with plate tectonic processes, mountain building, erosion and sedimentation. Prolonged consumption of arsenic-contaminated groundwater results in severe health issues like skin, lung, kidney and bladder cancer; coronary heart disease; bronchiectasis; hyperkeratosis and arsenicosis. Since the major source of arsenic in groundwater is of geogenic origin, the extend of pollution is complexly linked with aquifer geometry and aquifer properties of a region. Therefore, remedialmeasures are to be designed based on the sourcemineral, climatological and hydrogeological scenario of the affected region. The corrective measures available include removing arsenic from groundwater using filters, exploring deeper or alternative aquifers, treatment of the aquifer itself, dilutionmethod by artificial recharge to groundwater, conjunctive use, and installation of nano-filter, among other procedures. The vastmajority of people affected by arsenic contamination in the Asian countries are the poor who live in rural areas and are not aware of the arsenic poisoning and treatment protocols. Therefore, creating awareness and providing proper medical care to these people remain as a great challenge. Very few policy actions have been taken at international level over the past decade to reduce arsenic contamination in drinking water, with the goal of preventing toxic impacts on human health. We recommend that that United Nations Environment Programme (UNEP) andWHO should take stock of the global arsenic poisoning situation and launch a global drive to create awareness among people/medical professionals/health workers/administrators on this global concern. (C) 2021 ChinaUniversity of Geosciences (Beijing) and Peking University.

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作者: Dang, PP (Dang, Peipei); Li, GG (Li, Guogang); Yun, XH (Yun, Xiaohan); Zhang, QQ (Zhang, Qianqian); Liu, DJ (Liu, Dongjie); Lian, HZ (Lian, Hongzhou); Shang, MM (Shang, Mengmeng); Lin, J (Lin, Jun)

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摘要: Red phosphor materials play a key role in improving the lighting and backlit display quality of phosphor-converted white light-emitting diodes (pc-WLEDs). However, the development of a red phosphor with simultaneous high efficiency, excellent thermal stability and high colour purity is still a challenge. In this work, unique non-concentration quenching in solid-solution Cs3Gd1 - xGe3O9:xEu(3+) (CGGO:xEu(3+)) (x = 0.1-1.0) phosphors is successfully developed to achieve a highly efficient red-emitting Cs3EuGe3O9 (CEGO) phosphor. Under the optimal 464 nm blue light excitation, CEGO shows a strong red emission at 611 nm with a high colour purity of 95.07% and a high internal quantum efficiency of 94%. Impressively, this red-emitting CEGO phosphor exhibits a better thermal stability at higher temperatures (175-250 degrees C, >90%) than typical red K2SiF6:Mn4+ and Y2O3:Eu3+ phosphors, and has a remarkable volumetric negative thermal expansion (coefficient of thermal expansion, alpha = -5.06 x 10(-5)/degrees C, 25-250 degrees C). By employing this red CEGO phosphor, a fabricated pc-WLED emits warm white light with colour coordinates (0.364, 0.383), a high colour rendering index (CRI = 89.7), and a low colour coordinate temperature (CCT = 4508 K). These results indicate that this highly efficient red-emitting phosphor has great potential as a red component for pc-WLEDs, opening a new perspective for developing new phosphor materials.

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作者: Chen, F (Chen, Fang); Ma, TY (Ma, Tianyi); Zhang, TR (Zhang, Tierui); Zhang, YH (Zhang, Yihe); Huang, HW (Huang, Hongwei)

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摘要: Semiconductor-based photocatalysis as a productive technology furnishes a prospective solution to environmental and renewable energy issues, but its efficiency greatly relies on the effective bulk and surface separation of photoexcited charge carriers. Exploitation of atomic-level strategies allows in-depth understanding on the related mechanisms and enables bottom-up precise design of photocatalysts, significantly enhancing photocatalytic activity. Herein, the advances on atomic-level charge separation strategies toward developing robust photocatalysts are highlighted, elucidating the fundamentals of charge separation and transfer processes and advanced probing techniques. The atomic-level bulk charge separation strategies, embodied by regulation of charge movement pathway and migration dynamic, boil down to shortening the charge diffusion distance to the atomic-scale, establishing atomic-level charge transfer channels, and enhancing the charge separation driving force. Meanwhile, regulating the in-plane surface structure and spatial surface structure are summarized as atomic-level surface charge separation strategies. Moreover, collaborative strategies for simultaneous manipulation of bulk and surface photocharges are also introduced. Finally, the existing challenges and future prospects for fabrication of state-of-the-art photocatalysts are discussed on the basis of a thorough comprehension of atomic-level charge separation strategies.

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作者: Windley, BF (Windley, Brian F.); Kusky, T (Kusky, Tim); Polat, A (Polat, Ali)

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摘要: One of the most contentious areas of Earth Science today is when, or whether or not modern-style plate tectonics was in operation in the Archean Eon. In this review we present evidence that the onset of plate tectonics was not at 3.2 Ga, as popularly conceived, but was in operation during the Eoarchean by at least ca. 4.0 Ga. Following a review of the main Eoarchean supracrustal belts of the world, constrained by relevant geochemical/isotopic data, we present evidence that suggests that from at least ca. 4.0 Ga Earth produced considerable juvenile mafic crust and consequent island arcs by Accretionary Cycle Plate Tectonics. From similar to 3.2 Ga there was a gradual transition in geodynamics to more abundant active continental margin magmatism in the form of voluminous TTGs and sanukitoids. From 3.2 Ga to 2.5 Ga juvenile oceanic crust and arcs continued to form, accompanied by more active continental margin magmatism until similar to 2.7-2.5 Ga, by which time there were sufficient crustal rocks to amalgamate into incipient large continents, the fragmentation of which started the first complete classical Wilson Cycle Plate Tectonics of breaking apart and re-assembling large continental masses. In other words, there were two types of plate tectonics in operation in the early Earth, Accretionary Cycle Plate Tectonics and Wilson Cycle Plate Tectonics, but Wilson Cycle type plate interactions only became more common after contiguous continental landmass became voluminous and extensive enough around 2.7-2.5 Ga. Failure to realize this dual mechanism of continental growth may lead to erroneous ideas such as "plate tectonics started at 3.2 Ga", or "mantle plumes generated early Archean magmatic rocks." We present new geochemical data that together with lithological and structural relationships, negate the various plume-type speculations including stagnant lids, heat pipes, and mushy-lid tectonics. It is interesting to consider that the way Earth's crust developed in the first Gigayear of the geological record continued later, albeit in more advanced forms, into the Phanerozoic, where we can still recognize Accretionary Cycle Plate Tectonics and orogens still with short boundaries in examples including the Altaids of Central Asia, the Arabian-Nubian Shield, the Japanese Islands, and in incipient form in Indonesia, as well as Wilson Cycle Plate Tectonics that leads inexorably to continental collisions as in the Alpine-Himalayan orogen with its long plate boundaries. We recommend this holistic view of crustal growth and the evolution of continents that leads to a robust, viable, and testable model of Earth evolution.

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摘要: Salinity is a fundamental property of watermasses that is useful in paleoenvironmental and paleoecological studies, yet the theory of application of geochemical proxies to paleosalinity reconstruction is underdeveloped. Here, we explore the use of three elemental ratios for paleosalinity reconstruction: boron/gallium (B/Ga), strontium/barium (Sr/Ba), and sulfur/total organic carbon (S/TOC) ratios. We compiled a large set of modern aqueous and sedimentary chemical data representing a range of salinity facies (i.e., freshwater, brackish, marine) in order to test the relationships of these proxies to ambient watermass salinity and to determine their viability for paleosalinity analysis. Sediment data were limited to fine-grained siliciclastic units (muds/shales/mudstones) without significant carbonate content, in which the elements of interest were mainly acquired through adsorption of dissolved species, forging a connection between elemental proxy values and watermass chemistry. In modern systems, watermass salinity is correlated with these proxies, yielding r of +0.99 and +0.76 for aqueous and sediment B/Ga, +0.66 and +0.54 for aqueous and sediment Sr/Ba, and +0.98 for aqueous sulfate and +0.66 for sediment S/TOC (all significant at p(alpha) < 0.01). These relationships establish the basis for use of these elemental ratios as paleosalinity proxies. Elemental crossplots permitted estimation of approximate salinity thresholds for each proxy: (1) B/Ga is <3 in freshwater, 3-6 in brackish, and >6 in marine facies; (2) Sr/Ba is <0.2 in freshwater, 0.2-0.5 in brackish, and >0.5 in marine facies; and (3) S/TOC is <0.1 in freshwater and >0.1 in brackish and marine facies. S/TOC did not discriminate effectively between brackish and marine facies, probably because microbial sulfate reduction (MSR) is generally C-org-limited rather than sulfate-limited in both facies. The accuracies of these thresholds for prediction of the salinity facies of sediments are similar to 88% for B/Ga, similar to 66% for Sr/Ba, and similar to 91% for S/TOC. Although the Sr/Ba proxy is slightly less robust owing to difficulty in removing all carbonate Sr influence and/or to greater mobility of Sr and Ba in the burial environment, we strongly advocate use of multiple proxies in order to support paleosalinity interpretations. Finally, we illustrate the application of these proxies with case studies of (1) the Ordos Basin in North China, which contains Ordovician marine shales and Triassic terrestrial mudstones, and (2) the mid-Eocene Bohai Bay Basin in NE China, which accumulated brackish to marine mudstones. (C) 2019 Elsevier Ltd. All rights reserved.

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标题: Recent advances in carbon dioxide utilization

作者: Zhang, ZE (Zhang, Zhien); Pan, SY (Pan, Shu-Yuan); Li, H (Li, Hao); Cai, JC (Cai, Jianchao); Olabi, AG (Olabi, Abdul Ghani); Anthony, EJ (Anthony, Edward John); Manovic, V (Manovic, Vasilije)

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摘要: Carbon dioxide (CO2) is the major contributor to greenhouse gas (GHG) emissions and the main driver of climate change. Currently, CO2 utilization is increasingly attracting interest in processes like enhanced oil recovery and coal bed methane and it has the potential to be used in hydraulic fracturing processes, among others. In this review, the latest developments in CO2 capture, utilization, conversion, and sequestration are examined through a multi-scale perspective. The diverse range of CO2 utilization applications, including mineralization, biological utilization, food and beverages, energy storage media, and chemicals, is comprehensively presented. We also discuss the worldwide research and development of CO2 utilization projects. Lastly, we examine the key challenges and issues that must be faced for pilot-scale and industrial applications in the future. This study demonstrates that CO2 utilization can be a driver for the future development of carbon capture and utilization technologies. However, considering the amount of CO2 produced globally, even if it can be reduced in the near-to mid-term future, carbon capture and storage will remain the primary strategy and, so, complementary strategies are desirable. Currently, the main CO2 utilization industry is enhanced oil and gas recovery, but considering the carbon life cycle, these processes still add CO2 to the atmosphere. In order to implement other CO2 utilization technologies at a large scale, in addition to their current technical feasibility, their economic and societal viability is critical. Therefore, future efforts should be directed toward reduction of energy penalties and costs, and the introduction of policies and regulation encouraging carbon capture, utilization and storage, and increasing the public acceptance of the strategies in a complementary manner.

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作者: Chen, GZ (Chen, Guangzhao); Li, X (Li, Xia); Liu, XP (Liu, Xiaoping); Chen, YM (Chen, Yimin); Liang, X (Liang, Xun); Leng, JY (Leng, Jiye); Xu, XC (Xu, Xiaocong); Liao, WL (Liao, Weilin); Qiu, YA (Qiu, Yue'an); Wu, QL (Wu, Qianlian); Huang, KN (Huang, Kangning)

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摘要: Despite its small land coverage, urban land and its expansion have exhibited profound impacts on global environments. Here, we present the scenario projections of global urban land expansion under the framework of the shared socioeconomic pathways (SSPs). Our projections feature a fine spatial resolution of 1km to preserve spatial details. The projections reveal that although global urban land continues to expand rapidly before the 2040s, China and many other Asian countries are expected to encounter substantial pressure from urban population decline after the 2050s. Approximately 50-63% of the newly expanded urban land is expected to occur on current croplands. Global crop production will decline by approximately 1-4%, corresponding to the annual food needs for a certain crop of 122-1389 million people. These findings stress the importance of governing urban land development as a key measure to mitigate its negative impacts on food production.

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标题: Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey

作者: Zhong, BL (Zhong, Bao-Liang); Luo, W (Luo, Wei); Li, HM (Li, Hai-Mei); Zhang, QQ (Zhang, Qian-Qian); Liu, XG (Liu, Xiao-Ge); Li, WT (Li, Wen-Tian); Li, Y (Li, Yi)

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摘要: Unprecedented measures have been adopted to control the rapid spread of the ongoing COVID-19 epidemic in China. People's adherence to control measures is affected by their knowledge, attitudes, and practices (KAP) towards COVID-19. In this study, we investigated Chinese residents' KAP towards COVID-19 during the rapid rise period of the outbreak. An online sample of Chinese residents was successfully recruited via the authors' networks with residents and popular media in Hubei, China. A self-developed online KAP questionnaire was completed by the participants. The knowledge questionnaire consisted of 12 questions regarding the clinical characteristics and prevention of COVID-19. Assessments on residents' attitudes and practices towards COVID-19 included questions on confidence in winning the battle against COVID-19 and wearing masks when going out in recent days. Among the survey completers (n=6910), 65.7% were women, 63.5% held a bachelor degree or above, and 56.2% engaged in mental labor. The overall correct rate of the knowledge questionnaire was 90%. The majority of the respondents (97.1%) had confidence that China can win the battle against COVID-19. Nearly all of the participants (98.0%) wore masks when going out in recent days. In multiple logistic regression analyses, the COVID-19 knowledge score (OR: 0.75-0.90, P<0.001) was significantly associated with a lower likelihood of negative attitudes and preventive practices towards COVID-2019. Most Chinese residents of a relatively high socioeconomic status, in particular women, are knowledgeable about COVID-19, hold optimistic attitudes, and have appropriate practices towards COVID-19. Health education programs aimed at improving COVID-19 knowledge are helpful for Chinese residents to hold optimistic attitudes and maintain appropriate practices. Due to the limited sample representativeness, we must be cautious when generalizing these findings to populations of a low socioeconomic status.

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