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Viewpoint

The infinite separation principle

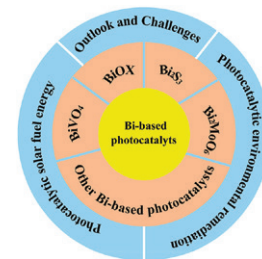
Suojiang Zhang* 1229

Review articles

Recent advances in bismuth-based photocatalysts: Environment and energy applications

Sijia Song, Zipeng Xing*, Huanan Zhao, Zhenzi Li*, Wei Zhou* 1232

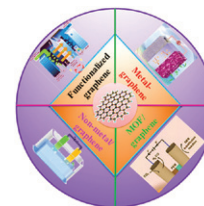
In this review, the recent progress of bismuth-based photocatalysts including BiOX, BiVO₄, Bi₂S₃, Bi₂MoO₆ and other Bi-based photocatalysts and their applications in environmental and energy are reviewed. The preparation strategies, structure characteristics, photocatalytic mechanism and applications are summarized, which may point out the future development direction of high-efficient bismuth-based photocatalysts.



Graphene-based electrocatalysts for advanced energy conversion

Pingping Yang, Xin Yang*, Wenzhu Liu, Ruike Guo, Zufu Yao* 1265

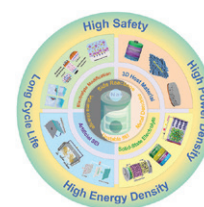
Recent progress of graphene-based hybrids for electrocatalytic energy conversion reaction is systematically reviewed, and the perspective insights and challenging issues are also concluded to provide directions for the future development.



Recent advanced development of stabilizing sodium metal anodes

Liyu Zhu, Yucheng Li, Jingyang Zhao, Jing Liu, Luying Wang, Jiandu Lei* 1279

Given the inevitable side reactions, uncontrollable dendrite growth, unstable SEI, and large volume change of Na metal anodes, various strategies are designed to construct Na-metal batteries with high safety, high power density, high energy density, and long cycle life.



High surface area biocarbon monoliths for methane storage

Elizabeth Michaelis, Renfeng Nie*, Douglas Austin, Yanfeng Yue* 1308

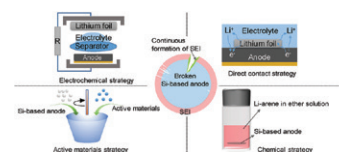
The development and research status of high porous carbon monoliths made from different activated biocarbons by using binder or binder less methods, and the applications of methane storage were reviewed.



Prelithiation strategies for silicon-based anode in high energy density lithium-ion battery

Tianqi Jia, Geng Zhong, Yao Lv, Nanrui Li, Yanru Liu, Xiaoliang Yu, Jinshuo Zou, Zhen Chen, Lele Peng, Feiyu Kang*, Yidan Cao* 1325

Unstable SEI and pulverized particles can lead to low coulombic efficiency of Si-based anode. Prelithiation can alleviate the issues, so that the amount of active Li^+ can be kept at a high level in the full cell.



Novel high-entropy oxides for energy storage and conversion: From fundamentals to practical applications

Zi-Yu Liu, Yu Liu*, Yujie Xu, Hualiang Zhang, Zongping Shao, Zhenbin Wang, Haisheng Chen* ..1341

High-entropy oxides: from fundamentals to energy applications. This picture presents fundamental knowledges of high-entropy oxides on energy conversion-storage. The content covers four basic aspects including common preparations, incidental characterizations, typical structures and the prospective applications so as to have a deeper understanding for energy and materials researchers.

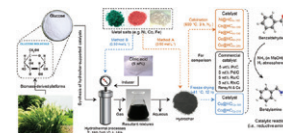


Research papers

Facile synthesis of hydrochar-supported catalysts from glucose and its catalytic activity towards the production of functional amines

Xiuzheng Zhuang, Jianguo Liu*, Longlong Ma* 1358

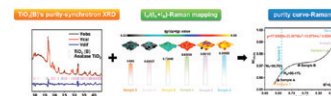
A hydrochar-supported catalyst was obtained from biomass-derive platform, which enable the synthesis of functional amines from carbonyl compounds with an excellent efficiency.



Accurate quantification of $\text{TiO}_2(\text{B})$'s phase purity via Raman spectroscopy

Jiamiao Ran, Hui Liu*, Hongliang Dong, Peng Gao, Haowei Cheng, Jianing Xu, Hailun Wang, Zixing Wang, Qingfeng Fu, Jiaxu Yan, Jilei Liu* 1371

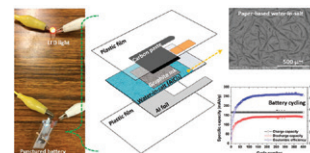
This research has developed an ease-accessible, rapid and accurate detection method to determine the purity of $\text{TiO}_2(\text{B})$, in order to promote its application as high-power lithium ion anode.



Paper-based aqueous Al ion battery with water-in-salt electrolyte

Yifei Wang*, Wending Pan, Kee Wah Leong, Yingguang Zhang, Xiaolong Zhao, Shijing Luo, Dennis Y.C. Leung* 1380

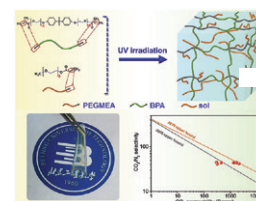
Water-in-salt electrolyte enables the normal charging of aqueous Al ion batteries using Al metal as negative electrode. By storing this semi-solid electrolyte inside a filter paper substrate and depositing the graphite ink on it as positive electrode, a low-cost yet high-performance flexible Al ion battery is obtained successfully, which is also highly safe to users and friendly to the environment.



Tailor-made microstructures lead to high-performance robust PEO membrane for CO₂ capture via green fabrication technique

Wei-Shi Sun, Ming-Jie Yin*, Wen-Hai Zhang, Shuo Li, Naixin Wang, Quan-Fu An* 1389

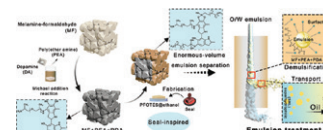
The PEO membrane was UV crosslinked by tuning the ratio of the two prepolymers (BPA and PEGMEA), aiming at obtaining the optimized microstructures with suitable mesh size and PEO sol content, offering a CO₂ permeability of 1711 Barrer, a CO₂/N₂ selectivity of 44, as well as stable running for 100 h.



3D inner-outer asymmetric sponge for enormous-volume emulsion wastewater treatment based on a new “demulsification-transport” mechanism

Ruixiang Qu¹, Shuaiheng Zhao¹, Na Liu, Xiangyu Li, Huajun Zhai, Ya'nan Liu, Yen Wei, Lin Feng* 1398

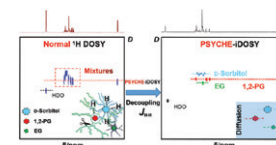
Chemical demulsification and 3D inner-outer asymmetric wettability are integrated together to fabricate a superwetting sponge, which can realize wettability gradient-driven oil directional transport for achieving unprecedented enormous-volume emulsion treatment based on a “demulsification-transport” mechanism.



NMR diffusion analysis of catalytic conversion mixtures from lignocellulose biomass using PSYCHE-iDOSY

Qi Zhao, Christian Marcus Pedersen, Jiamin Wang, Rui Liu, Yuanli Zhang, Xiuyin Yan, Zhenzhou Zhang, Xianglin Hou, Yingxiong Wang* 1409

PSYCHE-iDOSY NMR can record improved resolution spectra, which efficiently separate model and genuine samples from cellulose, hemicellulose and lignin, serving as a general approach alternative to chromatographic methods.

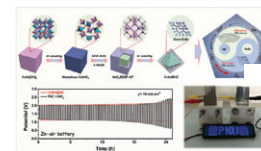


Manipulating oxygenate adsorption on N-doped carbon by coupling with CoSn alloy for bifunctional oxygen electrocatalyst

Chenlong Dong¹, Xilin Zhang¹, Shaoning Zhang¹, Siwei Zhao, Xueyu Lin, Xin Wang, Yajing Zhang, Fuqiang Huang* 1417

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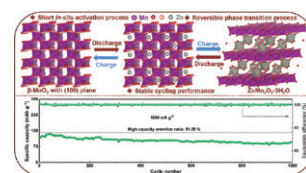
A highly active and robust bifunctional oxygen electrocatalyst—CoSn@NC, has been designed and prepared. The integration of CoSn nanoalloy into nitrogen-doped carbon renders the core-shell CoSn@NC with high activity and rapid reaction kinetics for both OER and ORR.



Crystal plane induced *in-situ* electrochemical activation of manganese-based cathode enable long-term aqueous zinc-ion batteries

Yuxin Gao, Jiang Zhou, Liping Qin*, Zhenming Xu, Zhexuan Liu, Liangbing Wang, Xinxin Cao, Guozhao Fang*, Shuquan Liang* 1429

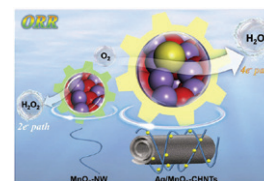
This work demonstrates the exposed (100) crystal plane can shorten the electrochemical activation process of β -MnO₂ cathode for aqueous zinc-ion batteries, and promote its in-situ phase transformation from tunnel-structure to layer-structured ZnMn₃O₇·3H₂O, which effectively guarantee fast diffusion kinetics and long cycling stability.



Enhancing O₂ electroreduction to H₂O on Ag/MnO₂-CHNTs by boosting a four-electron catalytic pathway

Aiai Zhang¹, Yang Liu¹, Caixia Li, Lei Xue, Ze Liu, Jinfang Wu*, Shanghong Zeng* 1437

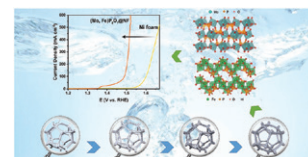
The introduction of Ag nanoparticles and CHNTs to MnO₂ can alter the pathway mechanism from a two-electron to a direct four-electron pathway for ORR, which is the nature of the remarkable enhancement of the electrocatalytic activity over Ag/MnO₂-CHNTs.



Mo/Fe bimetallic pyrophosphates derived from Prussian blue analogues for rapid electrocatalytic oxygen evolution

Jingyi Wang, Jiajia Huang*, Siyu Zhao, Ivan P. Parkin, Zhihong Tian, Feili Lai, Tianxi Liu, Guanjie He* 1450

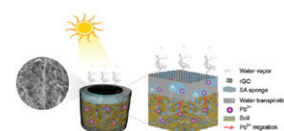
A Mo/Fe bimetallic pyrophosphate was derived from Prussian blue analogues, which is directly grown on a 3D porous conductive substrate through a facile and practical method for investigating and boosting the OER performance of self-supported electrocatalysts in alkaline salty water by constructing heterostructures and improving the hydrophilicity of materials.



Boosting extraction of Pb in contaminated soil via interfacial solar evaporation of multifunctional sponge

Pan Wu, Xuan Wu, Yida Wang, Jingyuan Zhao, Haolan Xu*, Gary Owens* 1459

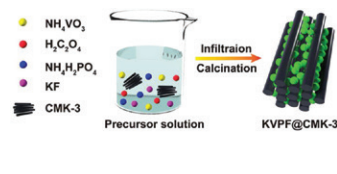
Interfacial solar evaporation is applied to quickly extract soil water together with heavy metals from a contaminated soil, thus opening a new research direction in the application of solar thermal energy to contaminated soil remediation.



KVPO₄F/carbon nanocomposite with highly accessible active sites and robust chemical bonds for advanced potassium-ion batteries

Jianzhi Xu¹, Liping Duan¹, Jiaying Liao, Haowei Tang, Jun Lin, Xiaosi Zhou* 1469

Benefiting from the in-situ grown KVPF nanoparticles confined in the highly ordered mesoporous carbon CMK-3 and forming V–F–C chemical bonds, the synthesized KVPF@CMK-3 nanocomposite shows efficient potassium storage properties.



Efficient conversion of lignin waste and self-assembly synthesis of C@MnCo₂O₄ for asymmetric supercapacitors with high energy density

Jiahui Mu, Cuihuan Li, Jiankang Zhang, Xianliang Song, Sheng Chen*, Feng Xu* 1479

The porous lignin-phenol-formaldehyde resins-derived carbon and MnCo₂O₄ composites (C@MnCo₂O₄) were synthesized with a facile self-assembly method. The asymmetric supercapacitor of C@MnCo₂O₄//LR-HPC assembled by C@MnCo₂O₄ as anode delivered maximum specific energy of 0.68 mWh cm⁻³.



Integration of pore structure modulation and B, N co-doping for enhanced capacitance deionization of biomass-derived carbon

Yao Qiu, Chunjie Zhang, Rui Zhang*, Zhiyuan Liu, Huazeng Yang, Shuai Qi, Yongzhao Hou, Guangwu Wen, Jilei Liu*, Dong Wang* 1488

Pore modulation and B, N co-doping are integrated into biomass-derived carbon for enhanced capacitive deionization. An expansion-activation (EA) strategy is proposed to modulate the hierarchical porosity. The synergistic effect of pore and B, N co-doping demonstrates increased ions-accessible sites and stronger Cl⁻, Na⁺ adsorption ability, resulting in enhanced desalination performance.

