



Front Cover

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Back Cover

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Research highlight

Exclusive CO₂-to-formate conversion over single-atom alloyed Cu-based catalysts

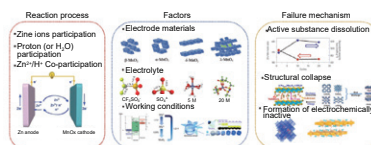
Junjun Li, Zhicheng Zhang*, Wenping Hu..... 855

Review articles

Understanding of the electrochemical behaviors of aqueous zinc–manganese batteries: Reaction processes and failure mechanisms

Xinyu Luo, Wenchao Peng, Yang Li, Fengbao Zhang, Xiaobin Fan*..... 858

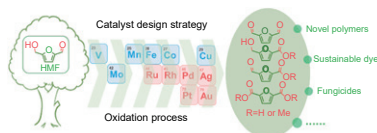
In this review, a systematic discussion from three aspects of reaction processes, influencing factors, and failure mechanisms of aqueous zinc–manganese batteries have carried out, followed by issues haven't overcome and future research directions of mechanism research.



Catalyst design strategy toward the efficient heterogeneously-catalyzed selective oxidation of 5-hydroxymethylfurfural

Huai Liu, Xing Tang*, Xianhai Zeng, Yong Sun, Xixian Ke, Tianyuan Li, Jiaren Zhang, Lu Lin..... 900

To improve the catalytic performance of the catalysts for the oxidation of 5-(hydroxymethyl)furfural (HMF), various catalyst design strategies have been developed to modify the geometric as well as the electronic configurations of the active centers, which have been systematically summarized in this review.

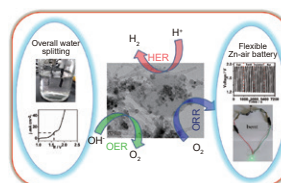


Research papers

Pd nanocluster-decorated CoFe composite supported on nitrogen carbon nanotubes as a high-performance trifunctional electrocatalyst

Revanasiddappa Manjunatha, Li Dong, Zibo Zhai, Jianyi Wang, Qianru Fu, Wei Yan*, Jiujun Zhang*..... 933

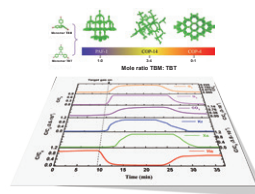
Pd nanocluster-decorated CoFe double-layered composite supported on nitrogen carbon nanotubes as a high-performance trifunctional electrocatalyst for water electrolysis and flexible Zinc-air battery applications.



High retention volume covalent organic polymer for xenon capture: Dynamic separation of Xe and Kr

Qian Wang¹, Zhu Meng¹, Juntao Li, Shuming Peng*, Zhonghua Xiang* 948

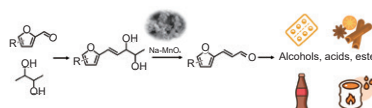
A new covalent organic polymer COP-14 is developed for Xe/Kr separation. Suitable pore size and structure make it successfully separates low concentration Xe (350 ppm) and Kr (35 ppm) in dynamic breakthrough experiments.



Na-MnO_x catalyzed aerobic oxidative cleavage of biomass-derived 1,2-diols to synthesis medium-chain furanic chemicals

Qing-Shan Kong, Xing-Long Li, Hong-Bo Shen, Hua-Jian Xu*, Yao Fu* 957

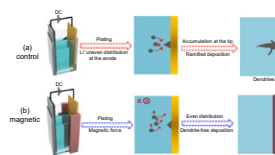
A strategy based on furanic platform chemicals was developed to synthesize a variety of high value-added furan-based compounds (diacids and esters, diols, hydroxy acids, acrylics), which simultaneously utilizes Na-MnO_x catalyst and practical catalytic methods.



Magnetically enhancing diffusion for dendrite-free and long-term stable lithium metal anodes

Yongxiu Chen, Xiangyu Dou, Kai Wang, Yongsheng Han* 965

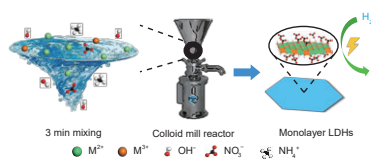
An introduction of external magnetic field vertical to the anode in lithium batteries leads to an enhanced even distribution of lithium ions at the surface, resulting in a dendrite-free lithium deposition.



Scaled-up synthesis of defect-rich layered double hydroxide monolayers without organic species for efficient oxygen evolution reaction

Haoyuan Chi¹, Jingwen Dong¹, Tian Li¹, Sha Bai, Ling Tan, Jikang Wang, Tianyang Shen, Guihao Liu, Lihong Liu, Luyi Sun, Yufei Zhao*, Yu-Fei Song* 975

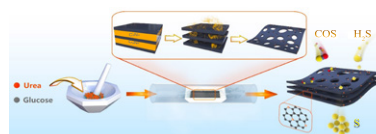
Through the separate nucleation and aging steps by using colloid mill reactor, monolayer LDHs were synthesized on a large scale. The defects-rich monolayer LDHs obtained by this method showed efficient electrocatalytic activity for oxygen evolution reaction.



Efficient catalytic removal of COS and H₂S over graphitized 2D micro-meso-macroporous carbons endowed with ample nitrogen sites synthesized via mechanochemical carbonization

Xun Kan¹, Guanqing Zhang¹, Yingying Luo, Fujian Liu*, Yong Zheng, Yihong Xiao, Yanning Cao, Chak-tong Au, Shijing Liang*, Lilong Jiang 983

Graphitized 2D micro-meso-macroporous carbons endowed with ultrahigh concentration of structural base nitrogen sites were synthesized by a one-step mechanochemical carbonization route. The samples act as high-efficient and stable catalysts for conversion of COS and H₂S to elemental sulfur.

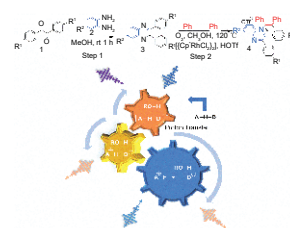


Synthesis and fluorescent properties of quinoxaline derived ionic liquids

Jiaqi Wu, Lei Zhang, Jinxing Long, Qiang Zeng, Biaolin Yin*, Xuehui Li*.....

996

Based on a two-step process including a dual Schiff's base formation and a [RhCp * Cl₂]₂-catalyzed oxidative C–H activation/annulation, a series of novel fluorescent isoquinolino [2,1-a]quinoxalin-5-ium ionic liquids (ILs) were prepared, showing dual or triple emissions due to the local excited state, charge transfer state and excited state proton transfer state of cation.

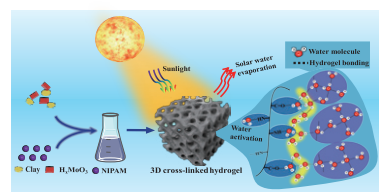


Building of multifunctional and hierarchical H_xMoO₃/PNIPAM hydrogel for high-efficiency solar vapor generation

Shuai Cao¹, Jingyun Jiang¹, Qingyong Tian*, Cang Guo, Xuzhe Wang, Kun Dai, Qun Xu*.....

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A novel multifunctional and hierarchically nanostructured H_xMoO₃/PNIPAM hydrogel with photothermal activity and activate water capacity was achieved via one-step polymerization. The H_xMoO₃-contained hydrogel solar evaporator device fabricated here possesses a competitive water evaporation rate of 1.65 kg m⁻² h⁻¹ with the energy efficiency of 85.87% under 1 kW m⁻² irradiation.

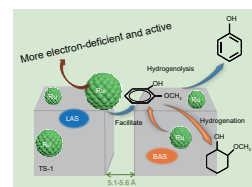


The influence of pore structures and Lewis acid sites on selective hydrogenolysis of guaiacol to benzene over Ru/TS-1

Yingying Xin, Zhaoxia Zheng, Zhicheng Luo*, Chengzhen Jiang, Shaofeng Gao, Zhihao Wang, Chen Zhao*.....

1014

Pore structure properties of MFI coupled with abundant LAS (TS-1) as well as Ru NPs on the orifice of pores of TS-1 promotes the hydrogenolysis of lignin to aromatics, while BAS on Ru/MFI promotes the hydrogenation rates of aromatics.

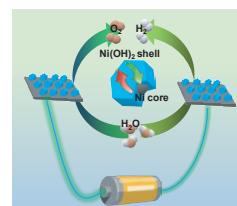


Engineering heterostructured Ni@Ni(OH)₂ core-shell nanomaterials for synergistically enhanced water electrolysis

Jun-Wei Zhang¹, Xian-Wei Lv¹, Tie-Zhen Ren*, Zheng Wang, Teresa J. Bandosz, Zhong-Yong Yuan*.....

1024

By integrating into high-efficiency alkaline water electrolyzer equipment, the well-designed heterostructured core-shell Ni@Ni(OH)₂ bifunctional electrocatalysts with remarkable overall water splitting activity will open up a promising energy storage way for a highly renewable and sustainable power utilization system.

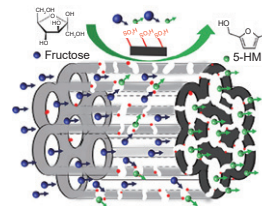


Synthesis of ordered hierarchically mesoporous/microporous carbon materials via compressed CO₂ for fructose-to-HMF transformation

Sen Luan, Wei Li*, Zanwu Guo, Wenxiu Li, Xiaojian Hou, Yi Song, Ran Wang, Qian Wang.....

1033

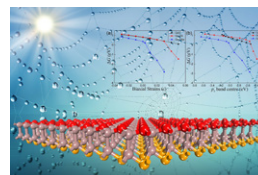
A well-ordered hierarchically porous carbon (HPC) material was fabricated via dual soft-templating approach with compressed CO₂. The as-prepared HPC sample as the catalysis carrier exhibited the excellent catalytic performance with high HMF yield and accelerated reaction rate in the fructose-to-HMF transformation.



Ga₂OSe monolayer: A promising hydrogen evolution photocatalyst screened from two-dimensional gallium chalcogenides and the derived janus

Yu Cui, Mengyuan Li, Xiaoli Zhang, Sufan Wang, Yucheng Huang* 1045

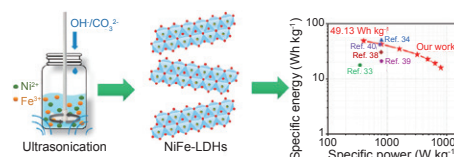
Density functional theory calculations were employed to screen the most effective photocatalyst for hydrogen evolution reaction among various two-dimensional gallium chalcogenides monolayers and the derived Janus monolayers.



Green fabrication of nickel-iron layered double hydroxides nanosheets efficient for the enhanced capacitive performance

Yuchen Wang, Zuo Chen, Man Zhang, Yaoyu Liu, Huixia Luo*, Kai Yan* 1053

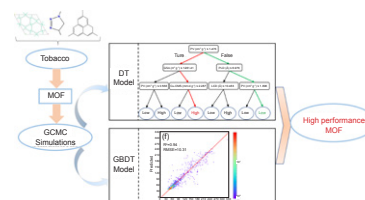
The nickel-iron layered double hydroxides (NiFe-LDHs) nanosheets were synthesized with a facile and eco-friendly ultrasonication-assisted methodology. The asymmetric supercapacitor assembled by NiFe-LDHs nanosheets and commercial activated carbon delivered a maximum specific energy of 49.13 Wh kg⁻¹.



Analyzing acetylene adsorption of metal-organic frameworks based on machine learning

Peisong Yang, Gang Lu*, Qingyuan Yang*, Lei Liu, Xin Lai, Duli Yu 1062

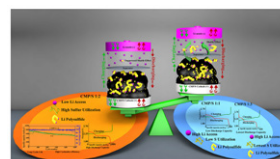
The article uses machine learning methods to build an accurate prediction model of MOFs' adsorption capacity for C₂H₂. According to the classification model, effective design rules are extracted, which is of great significance to the selection and design of materials.



Carbonized waste milk powders as cathodes for stable lithium-sulfur batteries with ultra-large capacity and high initial coulombic efficiency

Rabia Khatoun, Sanam Attique, Rumin Liu, Sajid Rauf, Nasir Ali, Luhong Zhang, Yu-Jia Zeng*, Yichuan Guo, Yusuf Valentino Kaneti*, Jongbeom Na, Haichao Tang, Hongwen Chen, Yang Tian, Jianguo Lu* 1071

A trash to treasure approach to utilize waste milk powders as cathode in Li-S batteries. Cathode comprises of CMP/S (1:2) exhibited best electrochemical performance compared to CMP/S (1:1) and CMP/S (1:3).



Vitamin B₉ derived nitrogen-doped graphene for metal-free aerobic oxidation of biomass-derived chemicals

Duan-Jian Tao*, Xin Zhao, Yanxin Wang, Xixi Liu, Hong-Ping Li, Zhang-Min Li, Yan Zhou, Ziliang Yuan, Zehui Zhang* 1084

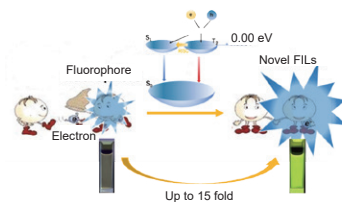
A superior carbocatalyst ultrahigh N-doped graphene (NG) was prepared by a novel self-sacrificial templating method of one-step annealing vitamin B₉. Systematic characterizations and quantum-chemical calculations further manifested that high contents of graphitic N and pyridinic N species in VB₉-NG-800 promoted the generation of $\cdot\text{O}_2^-$ active species from molecular oxygen effortlessly, resulting in excellent catalytic performance for aerobic oxidation.



A succinct enhanced luminescence strategy for fluorescent ionic liquids and the application for detecting CO₂

Siyang Che, Jiachen Guo, Lu Gan, Qiaoxin Xiao, Haoran Li, Yuanbin She, Congmin Wang* 1093

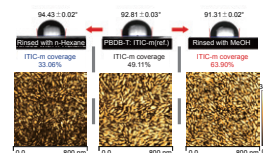
We reported a succinct enhanced luminescence strategy to reduce single-triplet energy split using the tunability of ionic liquids; thus up to 15 fold enhancements were achieved. This fluorescence ionic liquid has the advantages of a simple synthesis, convenient regulation and a remarkable effect, which has a good potential for detecting gas such as CO₂.



Versatile control of concentration gradients in non-fullerene acceptor-based bulk heterojunction films using solvent rinse treatments

Chang-Mok Oh¹, Soyeong Jang¹, Jihoon Lee, Sung Heum Park*, In-Wook Hwang* 1102

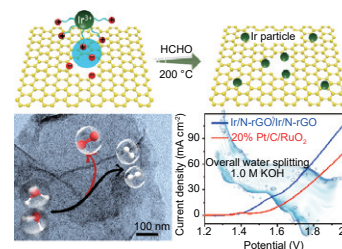
Material concentration gradient along the longitudinal direction of non-fullerene acceptor-based BHJ film, which is flexibly controlled by solvent rinse treatment using MeOH and n-hexane.



N-doped graphene anchored ultrasmall Ir nanoparticles as bifunctional electrocatalyst for overall water splitting

Wenqing Yao¹, Xian Jiang¹, Yulian Li, Cuiting Zhao, Linfei Ding, Dongmei Sun*, Yawen Tang*... 1111

The N-doped graphene anchored Ir nanoparticles (Ir/N-rGO) with ultrasmall particle size is synthesized via a simple hydrothermal method. Due to the synergy among ultrasmall Ir nanoparticle and N-doped rGO, the Ir/N-rGO exerts highly robust catalytic activity and durability toward the overall water splitting.



Homodispersed B-CN/P-CN S-scheme homojunction for enhanced visible-light-driven hydrogen evolution

Dashui Yuan, Zongyuan Li, Xueru Chen, Jing Ding*, Hui Wan, Guofeng Guan* 1119

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In order to achieve highly dispersed composite photocatalysts with excellent charge separation efficiency, herein we investigate the pre-doping of Boron and Phosphorus into heptazine and two-step calcination. B–CN and P–CN formed a homodispersed S-scheme homojunction and thus produced a rich interface. Meanwhile, caused by Fermi energy levels equilibrium, the band bending constructed an S-scheme homojunction, which stimulated photogenerated electrons to transfer from CB of B–CN to VB of P–CN.

