

Front Cover

Efficient cyclohexane dehydrogenation over Pt/B-ZrO₂ for H₂ production

Lipeng Guo, Jihui Yao, Xiaojun Bao, Haibo Zhu*

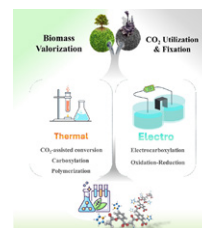
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Review articles

CO₂ utilization and fixation in biomass-derived furanics conversion: Thermochemical and electrochemical pathways

Saeideh Gharouni Fattah, Sabah Karimi, Shaoyu Yuan, Zheng Li, Mohammad Jalal Zohuriaan-Mehr*, Lu Lin, Xianhai Zeng*, Buxing Han*..... 1

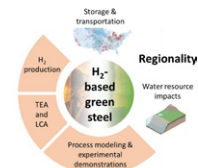
This review explores the dual role of CO₂ in the biomass valorization of furanic compounds and furanic compounds conversion. It highlights thermochemical and electrochemical routes for sustainable carbon fixation strategies, green chemical production, and future perspectives in CO₂-assisted biomass upgrading.



The need to consider regional supply chains and water usage in H₂-steel transition

Peng Peng*, Tae Lim, Fabian Rosner, Hanna Breunig, Prakash Rao, Arman Shehabi*..... 23

The use of H₂ has shown promises in decarbonizing the iron and steel sector. However, regional considerations related to the effects of H₂ storage and transportation, and water resource impacts are required for its large-scale deployment.



Advancements in synthesis strategies and environmental application of FAU-type zeolite: Bibliometric-driven review

Lin Chen^{1*}, Bingqing Xu¹, Siying Wang, Shan Ren, Fan Yang, Wei Zhang, Yuanpei Lan*, Chaoyi Chen, Junqi Li, Yanbing Su*..... 36

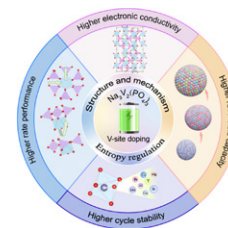
This review summarized crystallization pathways and synthesis strategies of FAU zeolites, emphasizing their environmental applications in heavy metal removal, CO₂ adsorption, and NO_x reduction, supported by bibliometric analysis to reveal global research trends and future directions.



Unraveling the regulation rules of vanadium-site cation substitution for $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ cathode materials toward high energy density sodium-ion batteries

Yi-Meng Wu, Jing-Yu Wang, Hao-Tian Guo, Peng-Fei Wang, Zong-Lin Liu*, Yan-Rong Zhu*, Jie Shu, Ting-Feng Yi*..... 62

In this paper, the research progress of $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ cathode material is comprehensively reviewed, focusing on the V-site doping modification from the perspective of entropy, which provides new ideas for the development of cathode materials for sodium-ion batteries.

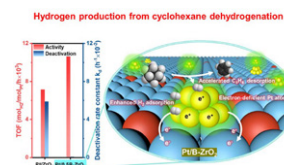


Research papers

Efficient cyclohexane dehydrogenation over Pt/B-ZrO₂ for H₂ production

Lipeng Guo, Jihui Yao, Xiaojun Bao, Haibo Zhu*..... 105

In the dehydrogenation of cyclohexane, Pt/B-ZrO₂ catalysts with an abundance of electron-deficient Pt atoms show excellent activity and stability, providing valuable insights for the rational design of efficient metal-based catalysts for hydrogen production.



Multi-scale nanofiber filter-based TENG for sustainable enhanced PM0.3 filtration and self-powered respiratory monitoring

Mengtong Yi¹, Nan Lu¹, Yukui Gou, Pinmei Yan, Hong Liu, Xiaoqing Gao, Jianying Huang*, Weilong Cai*, Yuekun Lai*..... 119

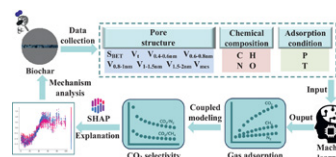
This illustration shows a self-powered TENG filtration system based on multi-scale nanofibers for capturing PM particles and improving air quality through physical interception and electrostatic adsorption interactions. Powered by breathing, the TENG also serves as a tool for respiratory monitoring.



Interpretable machine learning analysis on CO₂ adsorption and separation capacity of biochar under multi-scenario conditions

Jialiang Dong, Ruikun Wang, Yulong Xie, Fuyan Gao*, ShiTeng Tan, Zhenghui Zhao, Qianqian Yin, Eric J. Hu..... 131

Interpretable machine learning models were developed to predict CO₂ adsorption capacity and selectivity of biochar under varying conditions. Narrow micropores (<1 nm) and nitrogen functional groups play a key role in CO₂ selective adsorption.

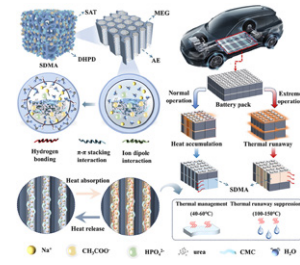


Advancing battery safety system: Introducing eutectic hydrated salt composite phase change materials with two stage thermal storage properties

Wensheng Yang, Zhubin Yao, Xinxin Li*, Canbing Li*, Ya Mao, Xiaoyu Zhou, Wei Jia, Yuhang Wu, Weifu Xu, Rui Liang, Xiaozhou Liu, Lifan Yuan, Zhizhou Tan..... 148

Green Energy & Environment

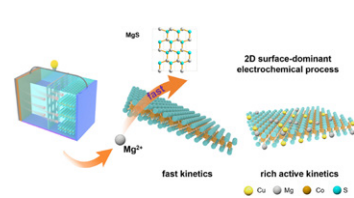
This research presents an innovative hydrated salt composite phase change material encapsulated with modifying expanded graphite (MEG) and acrylic emulsion (AE). The adhesion interactions are significantly improved owing to synergic effect between MEG and AE. It plays an important role in controlling temperature distribution and suppressing thermal runaway for battery module.



The architecture of Petal-shaped CoS/CuS nanosphere materials for high-performance magnesium-ion battery cathode materials

Runjing Xu, Yuan Fang, Xin Gao, Han Xiao, Zhiyuan Zhang, Jiayun Zhang, Huinan Yu, Jiafeng Ruan, Fengmei Wang, Xinjie Li, Ya Chen, Xiaodong Chen*, Lifeng Cui* 169

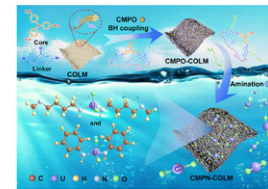
In this work, CoS/CuS petal-like nanocomposites with heterojunction structure were synthesized, and their use as the cathode materials of magnesium-ion batteries can rapidly enhance the kinetics of magnesium storage reaction and significantly improve the electrochemical performance of batteries.



Cutting-edge aminated conjugated microporous poly(aniline)s enabled high-performance membrane for seawater uranium extraction

Xiaoxia Ye, Bingqing Huang, Xueying Chen, Yaping Wang, Zhihong Zheng, Yifan Liu, Yuancai Lv, Chunxiang Lin, Jian Huang*, Jie Chen* 181

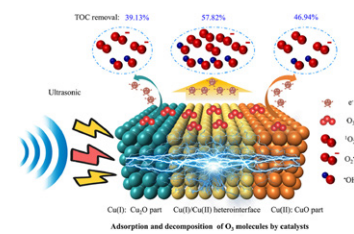
A sustainable CMPN-COLM membrane adsorbent is developed via BH coupling and amino/imide group functionalization, allowing a rapid, efficient but low-cost uranium extraction from seawater.



Ultrasonic-enhanced Cu(I)/Cu(II) nanointerfaces for sustainable ozone activation in green aluminum production: Atomic-level catalysis of organic waste degradation

Jianfeng Ran, Xu Sun, Jiaping Zhao, Shaoshuai Wei, Haisheng Duan, Ying Chen, Libo Zhang, Shaohua Yin* 195

An ultrasonically activated catalytic ozonation system featuring an atomically engineered Cu(I)/Cu(II) heterointerface catalyst was developed. This system enables efficient degradation of organic pollutants in extremely alkaline industrial Bayer liquor, thereby paving the way for sustainable aluminum metallurgy processes.

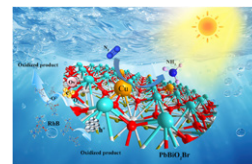


Cu doping induced lattice distortion and oxygen vacancy formation in PbBiO₂Br: Band structure modulation enhances photocatalytic nitrogen fixation and pollutant degradation performance

Green Energy & Environment

Shude Yuan¹, Yekang Zheng¹, Yuxin Chu, Chuanqi Xia, Ruoyu Dong, Jiating Xu, Botao Teng*, Ying Wu*, Yiming He*..... 211

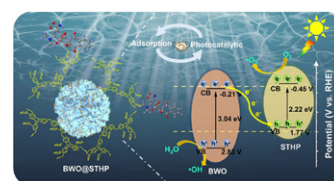
Cu doping modulates the electronic structure and surface defects of PbBiO₂Br, which is applied to photocatalytic nitrogen fixation for the first time, achieving significantly enhanced N₂ fixation and pollutant degradation performance.



Grafting sulfonated triptycene-based hypercrosslinked polymers onto Bi₂WO₆ for enhanced adsorption and photoelimination of antibiotics

Yingxue Zhang, Wanjun Xu, Xiao Yang, Shihong Dong, Najun Li, Qingfeng Xu, Hua Li, Jianmei Lu*, Dongyun Chen*..... 224

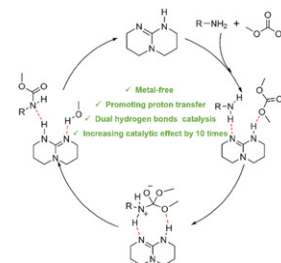
This study develops a binary heterojunction catalyst, x% BWO@STHP, enhancing adsorption and photocatalytic degradation of antibiotics. It achieves rapid adsorption equilibrium and complete degradation within 15 mins, showing excellent reusability and stability for environmental applications.



Enhancing C-N bond formation in amine carbonylation through dual hydrogen bonding catalysis under mild reaction conditions

Xiang Hui, Jianhui Shi, Jiajun Zhang, Yan Cao, Huiquan Li*, Peng He, Ligu Wang*..... 236

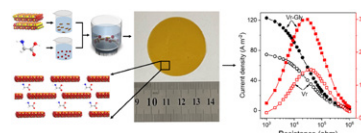
1,5,7-triazabicyclo[4.4.0]dec-5-ene (TBD) was used as a dual hydrogen-bonding catalyst in the carbonylation of amines under metal-free and mild conditions, exhibiting a 10 times enhancement in reaction rate compared to single-site catalysts. Mechanism research revealed that TBD synergistically activated amines and carbonyl sources, stabilized the intermediate, and then facilitated rapid proton transfer through hydrogen atom exchange.



Bio-inspired amino acid promoted nanofluidic ion transport and energy conversion in free-standing layered vermiculite-based membranes

Ruohan Feng¹, Chaoran Zhang¹, Di Zhang, Fang Song*..... 248

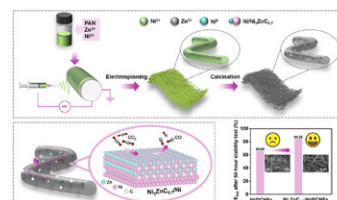
A bio-inspired strategy was developed to enhance nanofluidic ion transport by incorporating glycine, a small amino acid, into vermiculite-based membranes. This approach leverages glycine's molecular size and charge modulation properties to boost ionic conductivity while preserving the ordered nanochannel structure. The resulting vermiculite-glycine membrane exhibited significantly improved ion conductivity and power density for osmotic energy harvesting, representing a promising advancement in nanofluidic technology.



Optimizing CO production in electrocatalytic CO₂ Reduction via electron accumulation at Ni Sites in Ni₃ZnCo_{0.7}/Ni on N-doped carbon nanofibers

Min Wang¹, Ge Bai¹, Luwei Peng*, Lulu Li, Yadan Yu, Wenyi Li, Nianjun Yang, Daniil I. Kolokolove, Jinli Qiao*..... 258

A novel Ni₃ZnCo_{0.7}/Ni heterostructure electrocatalyst is constructed. The incorporation of zinc (Zn) into nickel (Ni) catalysts optimizes the adsorption of CO₂ intermediates, which mitigates over-activation. The electron transfer within the Ni₃ZnCo_{0.7}/Ni@CNFs system facilitates rapid electron transfer to CO₂. Furthermore, the catalyst exhibits remarkable stability, maintaining its crystal structure and morphology after 50 hours of electrolysis.



Upcycling FCC slurry via in-situ SiCl₄-catalyzed polycondensation: Constructing core-shell Si@C composites for high-stability lithium storage

Pengtao Fang, Haitao Song, Zhijian Da*..... 269

A clean, one-pot method transforms petroleum FCC slurry into a hollow core-shell Si@C anode (Si@Void@C_x), which exhibits exceptional structural stability (7% expansion after 1000 cycles), providing a scalable route for upcycling industrial by-products into high-performance batteries.

