



Front Cover

Efficient electro-catalytic desulfurization by in-situ oxidant generation

Yang Cao, Shilong Zhou, Linlin Chen, Yan Huang, Hui Liu, Yiru Zou, Peiwen Wu*, Haiyan Ji*, Wenshuai Zhu*, Chunming Xu

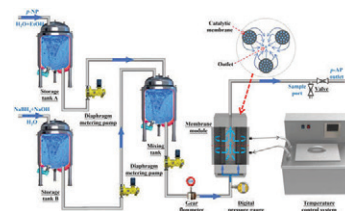
CONTENTS

Short communication

Integrated reaction–separation in a pilot-scale catalytic membrane reactor for efficient continuous *p*-nitrophenol hydrogenation

Ziming Chen¹, Yuyan Gao¹, Zhihao Guo¹, Yan Du, Zhengyan Qu, Jiuxuan Zhang*, Zhenchen Tang, Hong Jiang, Rizhi Chen*..... 2321

The pilot-scale catalytic membrane reactor demonstrated exceptional durability, maintaining nearly 100% *p*-nitrophenol conversion for over 600 h. With a membrane area of 1862 cm²—the largest reported to date—it highlights a significant breakthrough in scale-up of catalytic membrane technology.

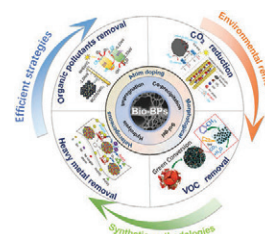


Review articles

Recent progress in biochar-based photocatalysts for environmental remediation

Ke Zhu, Yuheng Yao, Xiaoying Liang, Yi Yang, Hector F. Garces, Kai Yan*..... 2327

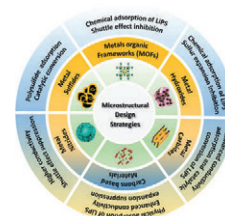
This review summarized the recent research progress of the synthesis, modification, and application of biochar-based photocatalysts (Bio-BPs) for environmental remediation. It also discussed the challenges and prospects for the sustainable development of high-performance Bio-BPs.



Advances in cathode's microstructure modification to boost performance of lithium-sulfur batteries

Modeste Venin Mendieev Nitou¹, Wu Yu¹, Waqas Muhammad, Ziheng Zhang, Daiqian Chen, Hesheng Yu, Mengjun Tang, Xiaodong Fang, Rui Liu, Yashuai Pang, Aadheeshwaran Samynathan, Benammar Djenet Sondra, Yinghua Niu, Weiqiang Lv*, Yuanfu Chen*..... 2351

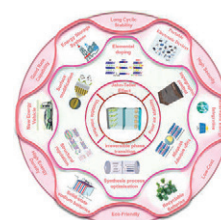
Innovative microstructural modification strategies of Li-S battery cathodes are carefully summarized. Strategies integrating carbon frameworks and metal compounds are emphasized, revealing breakthroughs that strengthen Li-S battery performance and positioning them as promising next-generation solutions.



Insights into degradation mechanisms and engineering strategies of layered manganese-based oxide cathodes for sodium-ion battery

Jun-Wei Yin, Yi-Meng Wu, Xin-Yu Liu, Jing Li, Peng-Fei Wang, Zong-Lin Liu, Lin-Lin Wang, Jie Shu, Ting-Feng Yi*..... 2392

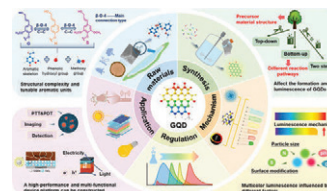
This review summarizes the present status of researches on manganese-based oxides for sodium-ion batteries, analyzes the problems of their applications, and provides solutions, which can provide guidance for subsequent researches.



Lignin-derived high-quality graphene quantum dots: Synthesis, mechanistic insights, and emerging applications

Zheyuan Ding, Kunye Zhang, Junzhong Xie, Cen kai Zhao, Haoyu Li, Yan Zhang, Min Wang*, Mingbo Wu*..... 2418

This figure illustrates the transformation of renewable lignin structural motifs into lignin-derived graphene quantum dots (L-GQDs), emphasizing tailored green synthesis strategies, tunable photoluminescence behaviors, and their versatile applications in biomedical, optoelectronic, and environmental fields.

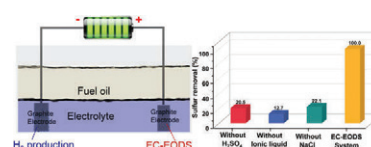


Research papers

Efficient electro-catalytic desulfurization by in-situ oxidant generation

Yang Cao, Shilong Zhou, Linlin Chen, Yan Huang, Hui Liu, Yiru Zou, Peiwen Wu*, Haiyan Ji*, Wenshuai Zhu*, Chunming Xu..... 2439

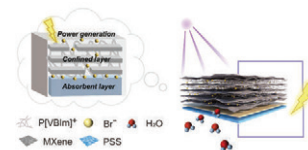
A novel extraction-coupled electrocatalytic oxidative desulfurization (EC-EODS) system achieves rapid, energy-efficient sulfur removal from fuel oils under mild conditions, with integrated product separation and electrolyte regeneration, offering a sustainable approach for cleaner fuel production.



High-performance moisture-driven power generators based on in-situ confined polymerized ionic liquid membranes

Rongrong Wang, Junfeng Lu, Wenjia Guo, Hao Dong, Nailiang Yang, Hua Li, Yanlei Wang*, Jianmei Lu*..... 2453

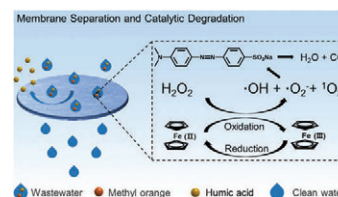
This study presents the preparation of high-performance moisture-driven power generators, which incorporate ion-transport nanochannels, ion sources, and water absorbent layer, offering a promising way for harnessing low-grade thermal energy from moisture.



Ferrocene-functionalized ultrafiltration membrane: Integrated approach for natural organic matter separation and catalytic degradation of small-molecule dye

Shaobin Wen, Jingyu Zhang, Bin Peng, Liyuan Fan, Qiang Zhang * 2461

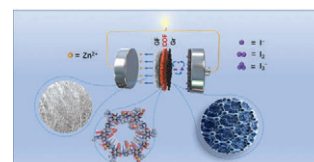
This study developed a ferrocene-based catalytic membrane via UV photopolymerization. By integrating Fenton reactions with membrane filtration, it efficiently degrades pollutants, prevents iron sludge, and offers self-cleaning and high reusability for advanced wastewater treatment.



Sulfonated covalent organic framework modified separator enables long-span and high-capacity zinc-iodine batteries

Tiao Huang, Shenglin Wang, Ming Wang, Hui Hu, Jianyi Wang*, Xiaofang Su, Songtao Xiao*, Jingyi Wu, Yanan Gao* 2475

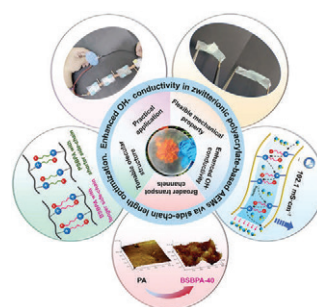
A sulfonated covalent organic framework based composite separator enables homogeneous Zn^{2+} flux and simultaneous suppression of polyiodides shuttling, leading to a long-span and high-capacity aqueous zinc-iodine battery.



Enhanced hydroxide conductivity in zwitterionic polyacrylate-based anion exchange membranes via side-chain length optimization

Lu Cai¹, Naibing Li¹, Bingbing Li, Tianchi Zhou*, Zhengyuan Zhou, Yongnan Zhou, Xi Luo, Kai ying Zhao, Yuekun Lai*, Jinli Qiao* 2487

This study reports a series of zwitterionic polyacrylates with meticulously designed molecular architectures, wherein the spacer length of the zwitterion is optimized. The BSBPA-40 membrane, featuring a longer spacer length, demonstrates more distinct microphase separation and exceptional OH^- conductivity, reaching 102.1 mS cm^{-1} at 80°C and 90% RH. Specifically, the BSBPA-40 membrane-based zinc-air battery achieves an exceptional power density of 156.7 mW cm^{-2} at room temperature, while its water electrolysis performance reaches 2.1 A cm^{-2} at 2.0 V .



Efficient construction of SiC membranes to filtrate high-temperature dust-laden gas for environmental sustainability

Shiying Ni, Yuqi Song, Dong Zou*, Zhaoxiang Zhong*, Weihong Xing..... 2500

An innovative support hydrophobization method was proposed to effectively solve particle penetration, enabling fabrication of defect-free asymmetric SiC membranes. The membranes achieve high gas permeance and 99.99% rejection towards $PM_{0.3}$ nanoparticles for high-temperature dust-laden gas filtration.

