

Front Cover

Sustainable aviation fuels from biomass and biowaste via bio- and chemo-catalytic conversion: Catalysis, process challenges, and opportunities

Junyan Zhang, Matthew S. Webber, Yunqiao Pu, Zhenglong Li, Xianzhi Meng, Michael L. Stone, Bingqing Wei, Xueqi Wang, et al.*

CONTENTS

Review articles

Recent progress and future perspectives of ionic liquid-based carbon dioxide capture and conversion

Anum Zafar, Karolina Matuszek, Douglas R. MacFarlane, Xinyi Zhang* 1097

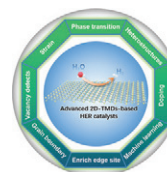
This review summarizes the most recent efforts devoted to IL-based absorption, catalysts, and CO₂ capture and utilization processes. We discuss the factors that affect the interaction between ILs and CO₂, impacting on the viscosity and CO₂ solubility and preview the coupling of CO₂ capture with electrochemical conversion of CO₂.



Recent advancements in two-dimensional transition metal dichalcogenide materials towards hydrogen-evolution electrocatalysis

Jianmin Yu, Gongao Peng, Lishan Peng, Qingjun Chen, Chenliang Su*, Lu Shang*, Tierui Zhang*... 1130

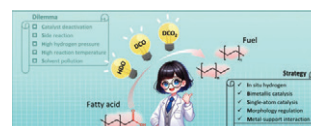
This review highlights the design and synthesis of high-performance 2D-TMDs-based HER electrocatalysts by combining theoretical calculations with experimental methods.



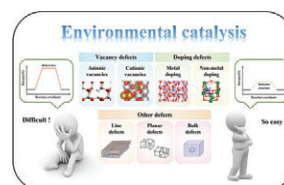
Dilemma and strategies for production of diesel-like hydrocarbons by deoxygenation of biomass-derived fatty acids

Hongju Lin¹, Xiyan Chen¹, Yanchang Chu, Jie Fu, Le Yang* 1153

This review introduced and compared the three reaction pathways of hydrodeoxygenation, decarboxylation and decarbonylation, for the deoxygenation of fatty acids and esters. The preference of reaction pathway is closely related to the type of raw materials and catalysts as well as reaction conditions.



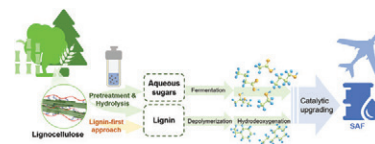
This review provides an overview of recent advances in defect engineering for environmental catalysis, addressing current research challenges and proposing future directions. Its aim is to guide the design and development of efficient environmental catalysts, along with future mechanistic studies.



Sustainable aviation fuels from biomass and biowaste via bio- and chemo-catalytic conversion: Catalysis, process challenges, and opportunities

Junyan Zhang, Matthew S. Webber, Yunqiao Pu, Zhenglong Li*, Xianzhi Meng, Michael L. Stone, Bingqing Wei, Xueqi Wang, Sainan Yuan, Bruno Klein, Bhogeswararao Seemala, Charles E. Wyman, Karthikeyan K. Ramasamy, Mike Thorson, Matthew H. Langholtz, Joshua S. Heyne, Aibolat Koishybay, Shiba Adhikari, Sufeng Cao, Andrew D. Sutton, Gerald A. Tuskan, Yuriy Román-Leshkov, Arthur J. Ragauskas, Tao Ling, Brian H. Davison..... 1210

Lignin-first approach followed by hydrodeoxygenation is used to produce SAF. Bio- and chemo-catalytic conversion pathways utilize the carbohydrate fraction of lignocellulose for SAF production. These parallel pathways offer great potential to producing all components of a cost-effective, 100% SAF.

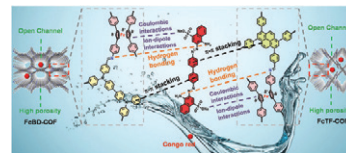


Research papers

Superb adsorption capacity of ferrocene-based covalent organic frameworks towards Congo red with high-pH resistance

Shenglin Wang¹, Qianqian Yan¹, Jiabin Yang, Hui Hu*, Songtao Xiao*, Yanan Gao* 1235

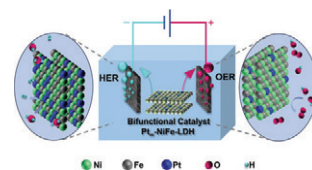
Two ferrocene (Fc)-based covalent organic frameworks are successfully synthesized for the first time and the obtained Fc-COFs exhibit ultrahigh adsorption capacity and good pH-resistance towards Congo red, and rank top among all porous materials reported previously, showing promising applications for organic dye removal in sewage processing.



A practical milling route for highly dispersed and tunably loaded Pt in NiFe hydroxides as bifunctional water-splitting electrocatalysts

Jinyang Wang¹, Peiyan Feng¹, Chenxiao Yang, Jiahao Yao, Zhe Deng, Menggai Jiao*, Li-Li Zhang, Wei Ma*, Zhen Zhou..... 1247

Simple milling produces highly dispersed Pt-loaded NiFe-layered double hydroxide electrocatalysts with enhanced water-splitting efficiency. This technique is practical for industrial-scale production.

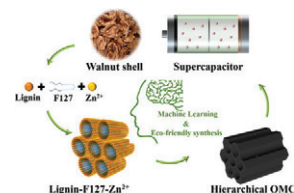


Eco-friendly synthesis coupled with predictive analytics: Developing hierarchical lignin-derived ordered mesoporous carbon for advanced supercapacitors

Xiaolan Zhao, Xiaoqi Wang*, Pei Gao, Peng Zhao, Jingjing Wang, Yingna Li, Zhibin Han, Boxiong Shen*.....

1256

Hierarchical ordered mesoporous carbon (HOMC) was fabricated and activated using an eco-friendly synthetic method with walnut shell derived lignin as carbon precursor, and Zn^{2+} as crosslinking agent. The HOMC demonstrated high performance for supercapacitors with the assistance of machine learning.

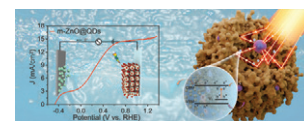


Surface-enhanced light harvesting over MOF-derived porous ZnO films for highly efficient QDs-based photoelectrochemical hydrogen generation

Yi Tao¹, Zikun Tang¹, Linjie Xie, Xiaolan Xu, Wei Zhao, Wenxuan Xu, Dequan Bao, Yihong Zhong, Zhenqiu Gao, Zhen Wen, Kanghong Wang*, Hao Zhang*, Xuhui Sun*.....

1270

This work reported a facile one-step pyrolysis method which can convert Zn-based MOF to porous ZnO (m-ZnO) with rough surface and abundant oxygen vacancies (O_v). When incorporating core-shell quantum dots (QDs) as the light absorbers, the obtained photoanodes (m-ZnO@QDs) achieved outstanding PEC performance for hydrogen generation, exhibiting 1.6 times and 5.8 times higher saturated photocurrent density than those of conventional TiO_2 @QDs and ZnO @QDs photoanodes, respectively.

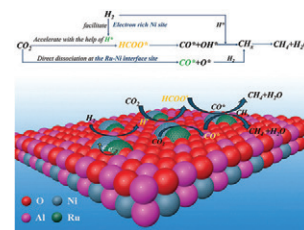


Enhanced CO_2 methanation through electronic modification of Ru to Ni in Ni-Al hydrotalcite-derived catalysts

Junming Zeng, Yongbin Yao, Fang Wang*, Jiajian Gao*, Lili Zhang, Guangwen Xu, Ziyi Zhong*, Fabing Su*.....

1280

The catalytic performance of the Ru-Ni-Al catalyst for CO_2 methanation is significantly improved through electronic interaction between Ru and Ni. The electron-rich Ni sites, derived from the electron transfer of Ru sites, help activate H_2 , produce more hydrides, and speed up the conversion of CO_2 to HCOO^* . Additionally, the formed Ru-Ni metal interface sites aid in the direct dissociation of CO_2 to CO^* . Both HCOO^* - and CO^* -mediated pathways work together to enhance CO_2 methanation on the Ru-Ni-Al catalyst.

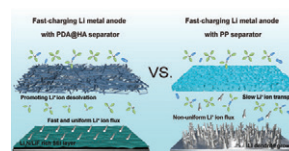


Stable and high-safety fast-charging lithium metal battery enabled by a polydopamine-functionalized hydroxyapatite/aramid hybrid nanofibers separator

Long Cheng, Ying-Jie Zhu*, Yaxin Zhang, Han-Ping Yu, Sida Xie, Dandan Li, Heng Li*, Shiyong Zheng*.....

1295

A polydopamine-modified hydroxyapatite/aramid (PDA@HA) hybrid nanofibers separator is developed to improve the stability and thermal safety of fast-charging lithium metal batteries (LMBs). The PDA@HA separator can accelerate Li^+ ion transfer kinetics and improve Li metal anode stability, thereby enabling excellent fast-charging LMB performance.

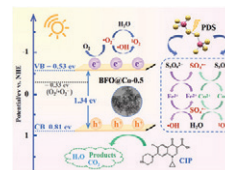


Enhanced degradation of ciprofloxacin via Co-doped $\text{Bi}_2\text{Fe}_4\text{O}_9$ photocatalysis under peroxydisulfate activation

Zizhen Wu, Jiawei Liu, Li Zhen, Jun Shi*, Huiping Deng*

1311

In this study, BFO@Co-0.5 photocatalyst with good magnetic and photoelectric properties was prepared for the synergistic degradation of CIP in visible light and PDS. The electron transfer paths and photocatalytic degradation mechanism are shown in the TOC figure.

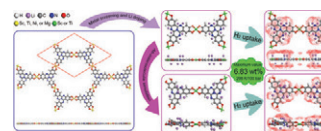


Tricycloquinazoline-based monolayer conjugated metal-organic frameworks as promising hydrogen storage media: A theoretical investigation

Zhaoshun Meng*, Qingyu Li, Huilin Sun, Yunhui Wang, Xing'ao Li*

1326

This work demonstrated the potential of tricycloquinazoline-based monolayer metal-organic frameworks (MMOFs with the first "M" representing metal species) as highly efficient materials for hydrogen (H_2) storage, with a particular emphasis on the influence of various metal species on H_2 binding and adsorption.

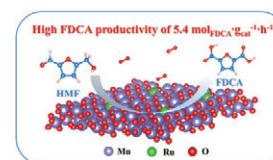


Ru single atoms in Mn_2O_3 efficiently promote the catalytic oxidation of 5-hydroxymethylfurfural through dual activation of lattice and molecular oxygen

Peiya Chen, Xinghao Li, Yuhua Liu, Huai Liu*, Rui Zhang, Wenlong Jia, Junhua Zhang, Yong Sun, Lincui Peng*

1337

The introduction of Ru single atoms into Mn_2O_3 facilitates the activation of both lattice and molecular oxygen, thus providing an exceptional catalytic activity for the aerobic oxidation of HMF to FDCA.



Enhanced and selective photocatalytic reduction of CO_2 to CH_4 using a Pt-loaded $\text{CuPc/g-C}_3\text{N}_4$ Z-scheme heterojunction catalyst

Jinshan Chen, Jiangfeng Lu, Ran Lang, Chi Wang*, Shuangyou Bao*, Yuan Li, Kai Li, Maohong Fan*

1348

In this study, a novel Pt-loaded $\text{CuPc/g-C}_3\text{N}_4$ (PtCuCN) composite was synthesized for the selective photocatalytic reduction of CO_2 to CH_4 under visible light. The PtCuCN catalyst achieved a CH_4 yield of $39.8 \mu\text{mol g}^{-1} \text{h}^{-1}$, significantly outperforming bulk $\text{g-C}_3\text{N}_4$ and CuPc alone by factors of 2.5 and 3.1, respectively, with a high selectivity of 90%.

