



## Front Cover

**Recent progress in carbon-based composite materials for advanced sodium ion batteries: From storage mechanism to structural design to applications as flexible electrodes**

*Ao Song, Yunchao Li\*, Dingkun Yuan, Jie Wu, Hailin Gu, Guangxue Zhang, Angjian Wu\*, Jiangrong Xu*

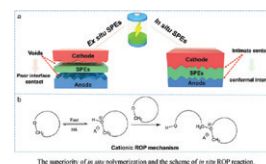
## CONTENTS

### Review articles

**Cyclic ethers-based solid electrolyte derived from *in situ* ring-opening polymerization strategy**  
Wubin Du<sup>1</sup>, Yong Wu<sup>1</sup>, Hao Cheng, Ran Bu, Kang Shen, Yuanzhong Tan, Zhijun Wu, Hongge Pan\*, Yifan Wang\*, Yingying Lu\*.....

1359

This paper reviews the advances in *in situ* ring-opening polymerization of cyclic ether-based solid-state polymer electrolytes, highlighting their interface advantages, polymerization strategies, and electrochemical applications, while promoting further research in this promising field.



**Recent progress on photothermal nanomaterials: Design, mechanism, and applications**

Xiao Yu, Shilin Fan, Bin Zhu, Soliman I. El-Hout, Jian Zhang\*, Chunlin Chen\*.....

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This review summarizes the research progress made in the past two decades in photothermal nanomaterials, including materials design, mechanism, and applications. It introduces the principles of material design and evaluation, analyzes the current challenges, and explores future development prospects.

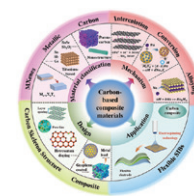


**Recent progress in carbon-based composite materials for advanced sodium ion batteries: From storage mechanism to structural design to applications as flexible electrodes**

Ao Song, Yunchao Li\*, Dingkun Yuan, Jie Wu, Hailin Gu, Guangxue Zhang, Angjian Wu\*, Jiangrong Xu.....

1437

The recent advances in carbon-based composite materials (CBCMs) for advanced sodium ion batteries are systematically reviewed. The adjustment methods to enhance the electrode performance are discussed in detail. The novel CBCMs (e.g., carbon-MXene composite) used in flexible electrodes are also investigated.

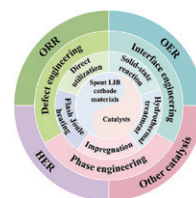


## Valorization of spent lithium-ion battery cathode materials for energy conversion reactions

Jin Zhang, Ding Chen, Jixiang Jiao, Weihao Zeng, Shichun Mu\* .....

1461

The review highlighted the high-added-value reutilization of spent lithium-ion batteries (LIBs) materials toward catalysts of energy conversion, including the failure mechanism of LIBs, conversion and modification strategies and their applications in catalysis.

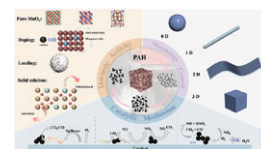


## Oxidation mechanism and performance control of manganese-based catalysts in soot oxidation

Tingyi Zhao<sup>1</sup>, Yuanjun Li<sup>1</sup>, Chengchun Wu, Wen Cao, Jiahao Gong, Menglan Xiao, Zuguo Song\*, Zhihui Shao, Mingqin Zhao\*, Bing Cui\* .....

1481

This review examines Mn-based catalysts for soot oxidation, focusing on mechanisms, performance control, and diesel exhaust purification, discussing design strategies, challenges, and future directions.



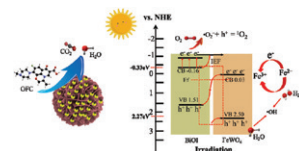
## Research papers

### Fe-O-Bi efficient electron transfer channels and photo-Fenton synergy in S-scheme heterojunctions: Insights into interfacial interactions and ofloxacin degradation

Jiawei Liu, Jun Shi\*, Huiping Deng\* .....

1503

A novel BiOI/FeWO<sub>4</sub> S-scheme heterojunction can activate H<sub>2</sub>O<sub>2</sub> and degrade the organic pollutant OFC under visible light. The S-scheme charge transfer mechanism was confirmed by XPS, in situ KPFM and DFT. The BiFe-5/Vis/H<sub>2</sub>O<sub>2</sub> system degraded OFC up to 96.4% in 60 min.

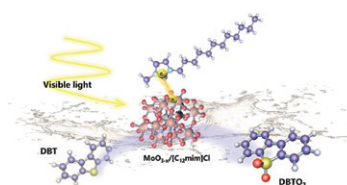


### Construction of imidazole-based ionic liquid modified MoO<sub>3-x</sub> for enhancing photocatalytic oxidation desulfurization in diesel

Suhang Xun\*, Chenchao Hu, Bohan Yang, Wei Jiang, Minqiang He\*, Wenshuai Zhu\*, Huaming Li...

1519

The MoO<sub>3-x</sub>/[C<sub>12</sub>mim]Cl photocatalyst with H-bonding interface coupling was prepared and the recombination of photo-generated electrons and holes is effectively suppressed. Enhanced by oxygen vacancy and ionic liquid modification, DBT was effectively converted to DBTO<sub>2</sub> in a short period of time under visible light in an extraction coupled photocatalytic oxidation desulfurization (ECPODS) system.

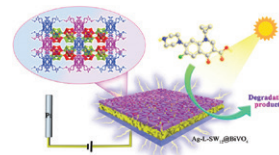


### Highly efficient photoelectrocatalytic degradation for ciprofloxacin with a new polyoxometalate-based metal-organic hybrid/BiVO<sub>4</sub> photoanode

Yuting Song, Tao Bo\*, Ji-Cheng Ma\*, Jian-Fang Ma\* .....

1531

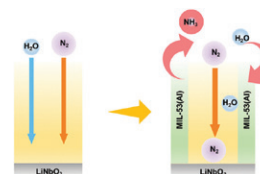
A novel polyoxometalate-based metal–organic hybrid material was synthesized and subsequently loaded onto the surface of BiVO<sub>4</sub> for the efficient photoelectrocatalytic degradation of ciprofloxacin under simulated solar radiation.



## MOF membrane boosts electrocatalytic nitrogen reduction on perovskite oxides

Tan Zhang, Qi Wang, Yuhan Sun, Jinping Li\*, Guang Liu\* ..... 1543

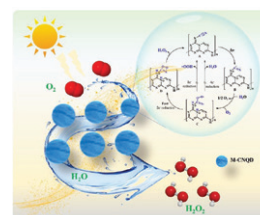
Decorating LiNbO<sub>3</sub> perovskite with a MIL-53(Al) MOF membrane (LN@MIL) selectively concentrates N<sub>2</sub> and repels H<sub>2</sub>O at the interface, effectively suppressing hydrogen evolution reaction (HER) and thereby enhancing nitrogen reduction reaction (NRR) activity.



## Carbon nitride quantum dots decorated with cyano groups for boosting photocatalytic hydrogen peroxide production

Ke Kong, Hong Zhong\*, Dejian Chen, Fushuai Zhang, Xiaojun Li, Ruihu Wang\* ..... 1551

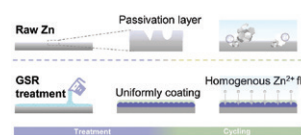
The graphitic carbon nitride quantum dots decorated with cyano groups has been prepared for photocatalytic H<sub>2</sub>O<sub>2</sub> production from H<sub>2</sub>O and O<sub>2</sub>. The cyano groups not only serve as the O<sub>2</sub> adsorption sites, but also facilitate the formation of suitable intermediates for H<sub>2</sub>O<sub>2</sub> formation. The photocatalytic system shows promising activity and durability under visible light irradiation without any additives.



## In situ converting the native passivation layer into a fast ion transport interphase to boost the stability of zinc anodes

Zi-Long Xie, Yunhai Zhu, Jia-Yi Du, Dong-Yue Yang, Hao Chen, Zhi Wang, Gang Huang\*, Xin-Bo Zhang\* ..... 1559

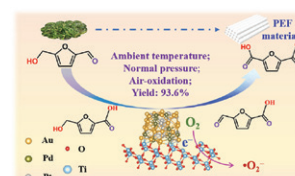
A gel sustained-release strategy that could in situ convert the zinc native passivation layer into a composite interphase layer has been developed. This interphase layer with homogeneous Zn<sup>2+</sup> transport and anti-corrosion ability protects the zinc anodes with significantly improved stability.



## Ambient temperature catalyzed air-oxidation of 5-hydroxymethylfurfural via ternary metal and oxygen vacancies

Yunlei Zhang, Yiran Liu, Qinghua Xia, Yao Chen, Lingzhao Kong\*, Xingchen Yan\*, Wen Guan, Jianming Pan\* ..... 1568

This work manipulates and unveils synergistic enhancement of ternary metal and oxygen vacancies over AuPdPt/TiO<sub>2</sub>@HNTs catalyst, achieving a high FDCA yield of 93.6%, accompany with FDCA formation rate of 67.58 mmol·g<sup>-1</sup>·h<sup>-1</sup> and an excellent TOF value of 17.54 h<sup>-1</sup>, under normal air pressure at ambient temperature in water.



## Tailor of frustrated Lewis pairs in Ag/CeO<sub>2</sub> for producing 4-aminophenol

Huaiquan Zhao, Hongye Bai\*, Zhenzhen Huang, Guanhua Wang, Hongliang Dai, Xuliang Pang\*, Hongping Li\*, Weiqiang Fan\*.....

1583

Ag tailoring Frustrated Lewis pairs of CeO<sub>2</sub> has been demonstrated as an efficient strategy for treating 4-NP pollutant. Ag/CeO<sub>2</sub> reach a desirable reaction rate of 4-NP up to 4.70  $\mu\text{mol}\cdot\text{min}^{-1}$ , with 99.5% faraday efficiency and 98.8% conversion.

