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Experimental and numerical efforts to improve oxygen mass transport in porous catalyst layer of proton exchange membrane fuel cells

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A wearable sustainable energy harvesting-storage hybrid self-charging power textile is developed. The power textile consists of a coaxial fiber-shaped polylactic acid/reduced graphene oxide/polypyrrole (PLA-rGO-PPy) triboelectric nanogenerator (fiber-TENG) that can harvest low-frequency and irregular energy during human motion as a power generation unit, and a novel coaxial fiber-shaped supercapacitor (fiber-SC) prepared by functionalized loading of a wet-spinning graphene oxide fiber as an energy storage unit. The fiber-TENG and fiber-SC are flexible yarn structures for wearable continuous human movement energy harvesting and storage as on-body self-charging power systems, with great portability and wide applicability. The integrated power textile can provide an efficient route for sustainable working of wearable electronics.

In-situ fabrication of carbon compound NiFeMo-P anchored on nickel foam as bi-functional catalyst for boosting overall water splitting

Xiangyang Zhou, Tingting Yang, Ting Li, Youju Zi, Sijing Zhang, Lei Yang, Yingkang Liu, Juan Yang, and Jingjing Tang*

Central South University, China

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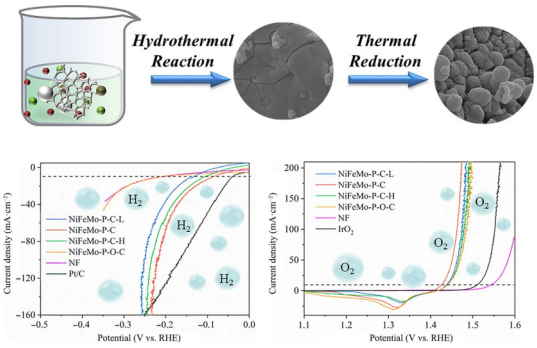

The carbon compound NiFeMo-P anchored on nickel foam (NiFeMo-P-C) was successfully constructed via hydrothermal and hydrogen reduction methods. The synergistic effect between alloy and metal phosphide, as well as the carbon composition and partially broken hollow morphology, allowing for much higher oxygen evolution reaction (OER)/hydrogen evolution reaction (HER) activity and superior stability.

Review Articles

Front Cover

Experimental and numerical efforts to improve oxygen mass transport in porous catalyst layer of proton exchange membrane fuel cells

Zhaojing Ni[1], Kai Han[2], Xianchun Chen[1], Lu Wang[1,*], and Bo Wang[1,*]

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[2] Beijing Institute of Technology Chongqing Innovation Center, China

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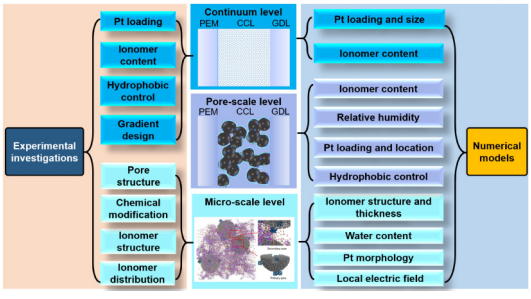

Classification of experimental and numerical strategies to improve the oxygen transport resistance in catalyst layer of proton exchange membrane fuel cell as per different length-scales.

The past, present, and future of piezoelectric fluoropolymers: Towards efficient and robust wearable nanogenerators

Md. Mehebub Alam and Xavier Crispin*

Linköping University, Sweden

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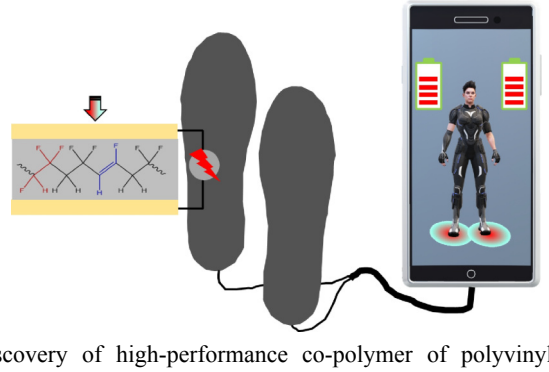

Discovery of high-performance co-polymer of polyvinylidene difluoride (PVDF) shows promise to bring piezoelectrics to flexible and large-area applications such as smart textiles. Enegry harvesting from the body can power next generation wearable sensors and personal electronics.

Metal–organic framework and carbon hybrid nanostructures: Fabrication strategies and electrocatalytic application for the water splitting and oxygen reduction reaction

Ziyun Su[1], Qiupin Huang[1], Qian Guo[1], S. Jafar Hoseini[2], Fuqin Zheng[1,*], and Wei Chen[1,*]

[1] Guangxi Normal University, China
[2] Shiraz University, Iran

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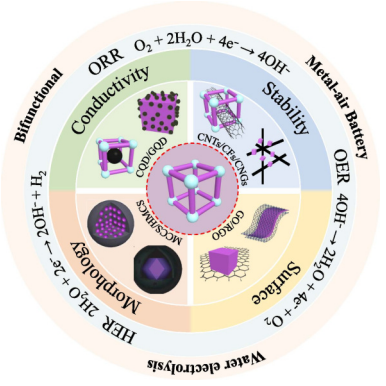

Due to the large surface area, adjustable pore structures, selectable functionalized organic ligands, and cavities for accommodating guest molecules, Metal-organic frameworks (MOFs) have attracted intensive attentions for designing and fabricating advanced electrocatalysts. Meanwhile, various carbon materials have been widely used in electrocatalytic field. In recent years, combining these two classes of structures is an important strategy to develop novel catalysts for energy storage and conversion. In this article, the most recent advances of MOF/carbon composites are reviewed, including their synthesis methods, and their electrocatalytic applications in different reactions of hydrogen evolution reaction (HER), oxygen evolution reaction (OER), and the oxygen reduction reaction (ORR). Especially, the synergistic effects between MOF and carbon-based materials for optimizing the electronic structure of the active sites and promoting catalytic performances are discussed. Finally, the challenges and future efforts to develop MOF/carbon composites are outlined.

Property modulations of two-dimensional materials under compression

Zhen Wu, Yuxi Wang, Yunjie Dou, Lin Zhou, and Jia Zhu*

Nanjing University, China

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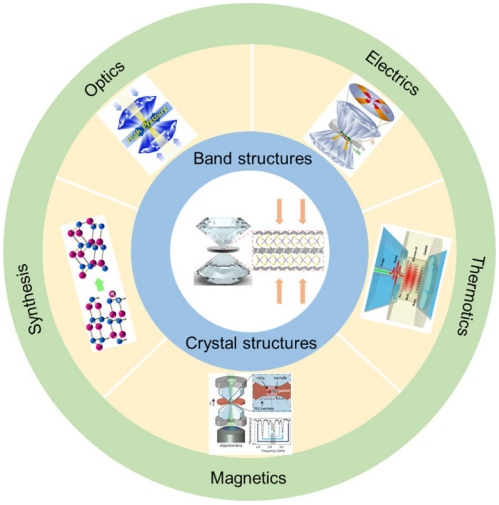

High-pressure is identified as a new knob in two-dimensional (2D) materials physics, leading to the effective modulations on the crystal and band structures. Exploring the effect of pressure on 2D material in situ help uncover more novel properties. A comprehensive and systematical review covering the recent work on modulations of 2D materials by pressure, highlighting innovative knob and unique strategies to manipulate physico-chemical properties.

Progress of organic, inorganic redox flow battery and mechanism of electrode reaction

Yinping Liu[1], Yingchun Niu[1], Xiangcheng Ouyang[1], Chao Guo[1], Peiyu Han[1], Ruichen Zhou[1], Ali Heydari[1], Yang Zhou[1], Olli Ikkala[2], Glazkov Artem Tigranovich[3], Chunming Xu[1], and Quan Xu[1,*]

[1] China University of Petroleum (Beijing), China
[2] Aalto University and VTT, Finland
[3] Mendeleev University of Chemical Technology of Russia, Russia

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The latest development of inorganic vanadium flow batteries, iron-chromium flow batteries, zinc-based redox flow batteries, organic redox flow batteries, and novel flow batteries are reviewed. In addition, the electrode reaction of redox flow batteries (RFBs) and their modification mechanism are also studied, which is used to improve the performance and economic benefits of RFBs.

Design strategies towards transition metal single atom catalysts for the oxygen reduction reaction—A review

Yaojia Cheng[1], Hao Wang[1], Haoqiang Song[1], Kan Zhang[2], Geoffrey I.N. Waterhouse[3], Jiangwei Chang[1,*], Zhiyong Tang[4], and Siyu Lu[1,*]

[1] Zhengzhou University, China
[2] Nanjing University of Science and Technology, China
[3] The University of Auckland, New Zealand
[4] National Center for Nanoscience and Technology, China

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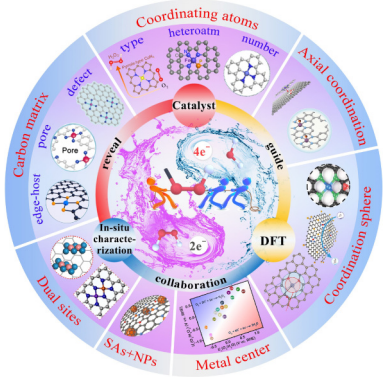

In-situ/operando characterization measurements and theoretical predictions are summarized to deepen understanding of the structure-performance relationships of transition metal single atom catalysts (TM SACs) dispersed on N-doped carbon supports at both atomic and molecular level. Meanwhile, some perspectives are offered relating to the fundamental science needed for TM SACs to find practical application in a wide-range of energy storage and conversion devices.

Recent progress on the synthesis and applications of high-entropy alloy catalysts

Xiaoxiao Han[1,2], Lingling Zhang[1,2,*], Xiao Wang[1,2], Shuyan Song[1,2,*], and Hongjie Zhang[1,2,3,*]

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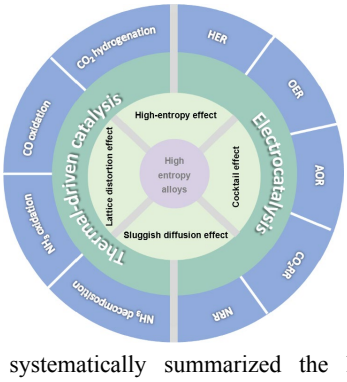

This review systematically summarized the latest advances regarding high entropy alloys (HEAs), with emphasis on the synthesis methods and catalytic applications. And we hope to provide a valuable route to understand this research field.

AIMS & SCOPE

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- Electrocatalysis and photocatalysis
- Carbon capture and storage

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