

The detrimental impacts of climate change coupled with increasing global energy demand has resulted in a significant research effort to develop clean technologies for energy generation, conversion, storage, distribution as well as the removal of CO₂ from various industrial sectors. Undoubtedly, electrocatalysis will play a major role in each of these ...

Metal-organic frameworks (MOFs) are promising porous precursors for the construction of various functional materials for high-performance electrochemical energy storage and conversion. Herein, a facile two-step solution method to rational design of a novel electrode of hollow NiCo₂O₄ nanowall arrays on flexible carbon cloth substrate is reported.

In view of these hotspots, we propose this Special Issue titled "Advanced Materials for Electrocatalysis and Energy Storage", designed to bring together researchers to address these issues. The main objective of this Special Issue is to publish relevant scientific papers. Original research articles, reviews, and communications are welcome.

This review article underlines the most recent research advances on 2D MXene materials for clean energy conversion via electrocatalysis and ... flexible electronics, and the energy storage sector. ...

Next-generation wearable technology needs portable flexible energy storage, conversion, and biosensor devices that can be worn on soft and curved surfaces. The conformal integration of these devices requires the use of soft, flexible, light materials, and substrates with similar mechanical properties as well as high performances. In this review, we have collected ...

The feasibility studies present energy storage, energy conversion, and energy harvesting applications presenting great potential of the environmentally friendly BZT-based materials to be ...

MXenes, as an emerging 2D material, are expected to exert a great influence on future energy storage and conversion technologies. In this review, we systematically summarize recent advances in MXene-based materials in electrocatalysis, particularly in the hydrogen evolution, oxygen evolution, oxygen reduction, nitrogen reduction, and CO₂ reduction ...

Metal-free multiporous carbon for electrochemical energy storage and electrocatalysis applications ... The flexible wire supercapacitor achieved an energy density of 3 W h kg⁻¹ at a power density of 450 W kg⁻¹ and a gravimetric specific capacitance of 106 F g⁻¹ at a current rate of 0.5 A g⁻¹.

Finally, the challenges and outlooks of POM-based materials in electrocatalysis and energy storage are briefly

discussed, and we look forward to the development of efficient and controllable POM-based electrocatalytic and electrode materials. ... POMs can be applied as flexible scaffolds to assemble POM-based materials through host-guest ...

Flexible energy storage devices with wide operating temperature range. ... Zang, X. et al. Self-assembly of large-area 2D polycrystalline transition metal carbides for hydrogen electrocatalysis.

In electrocatalysis, preferring the reaction paths by high throughput screening, and establishing new catalyst design strategies that can greatly promote the development of ...

Energy storage and conversion technologies are vital to the efficient utilization of sustainable renewable energy sources. Rechargeable lithium-ion batteries (LIBs) and the emerging sodium-ion batteries (SIBs) are considered as two of the most promising energy storage devices, and electrocatalysis processes play critical roles in energy conversion techniques that achieve ...

These MOF-derived active materials for electrocatalysis and energy storage are nanohybrids consisting of more than functional components that are purposely integrated together at desired length scales for much-improved performance. This article reviews the current status of these nanohybrids and concludes with a brief perspective on the future ...

Energy Storage Mater, 2022, 45: 656-666. ... A study of synergistic adsorption-electrocatalysis function. Nano Energy, 2019, 60: 332-339 ... Synergistic interfacial bonding in reduced graphene oxide fiber cathodes containing polypyrrole@sulfur nano-spheres for flexible energy storage. Angew Chem Int Ed, 2022, 61: e202212151 ...

3 · Over the last decade, there has been significant effort dedicated to both fundamental research and practical applications of biomass-derived materials, including electrocatalytic ...

To meet the demand for flexible high-energy storage, significant efforts have also been made to develop various flexible power sources. In this regard, Liu et al. [184] prepared a nanoporous carbon nanofiber film as the air cathode in a liquid Zn-air battery and a flexible all-solid-state rechargeable Zn-air battery.

In addition to the energy storage devices, electrocatalysis is an important energy-conversion avenue for a renewable energy economy. To date, intensive studies are focused on the following electrocatalytic reactions: hydrogen evolution reaction (HER),[4] oxygen evolution reaction (OER)[5] and oxygen reduction reaction (ORR).[6]

The increased interest in smart and portable electronic gadgets has led to the development of flexible and wearable energy storage systems. Herein, the oxygen vacancy-enriched Na-MnO $2-x$ is synthesized using a simple, scalable, and inexpensive electrodeposition method. The oxygen vacancy enrichment effectively

enhances the conductivity and reaction ...

Paper-based materials are emerging as a new category of advanced electrodes for flexible energy storage devices, including supercapacitors, Li-ion batteries, Li-S batteries, Li-oxygen batteries ...

Flexible transparent electrochemical energy conversion and storage devices (FT-EECSs), with enduring mechanical flexibility, outstanding optical transmittance, excellent electrochemical ...

Flexible MOF-based sensors could be integrated into energy storage devices, such as batteries or supercapacitors, to monitor their performance and health, enabling more efficient and safer energy systems. ... and Xue Yang. 2024. "Electrocatalysis in MOF Films for Flexible Electrochemical Sensing: A Comprehensive Review" Biosensors 14, no. 9: ...

To address these utmost concerns, electrochemical energy conversion and storage (EECS) devices have converged as ecologically sustainable energy systems.[1], [2] Extensive research has been continuously carried out in the energy conversion areas as photo- and electrocatalyst, for example, H₂ production via water-splitting, methanol generation ...

3 · Over the last decade, there has been significant effort dedicated to both fundamental research and practical applications of biomass-derived materials, including electrocatalytic energy conversion and various functional energy storage devices. Beyond their sustainability, eco-friendliness, structural diversity, and biodegradability, biomass-derived materials provide ...

The efficiency of energy conversion and storage can be increased by using these catalyst systems, which can support numerous reactions in a single operation. Green Chemistry and Sustainability: As the importance of sustainability increases, catalyst design will move toward more environmentally and energy-efficient methods. To reduce the impact ...

The associated challenges and possible mitigation in energy storage and electrocatalysis are also discussed. This review may inspire further research in pushing Ni₃N-based materials for diverse ...

Her research interests focus on developing micro/nanomaterials for renewable energy conversion and electrochemical energy storage devices (e.g. zinc-air batteries, lithium-ion batteries, lithium-sulfur batteries), as well as interface engineering to improve the device performance for flexible/wearable applications.

Abstract The development of two-dimensional (2D) high-performance electrode materials is the key to new advances in the fields of energy storage and conversion. As a novel family of 2D layered materials, MXenes possess distinct structural, electronic and chemical properties that enable vast application potential in many fields, including batteries, supercapacitor and ...

Introduction of MXene Materials. MXene materials, a class of two-dimensional (2D) transition metal carbides, have emerged as a revolutionary group of compounds with exceptional properties. They offer a wide range of applications, particularly in energy storage, electrocatalysis, and flexible electronics.

Photo/electrocatalysis (photocatalysis synergizing with electrocatalysis) has been a new research hotspot for energy conversion and storage. The insightful understanding on synergistic effects is very important for designing high-performance catalysts to address the key issues on sluggish reaction kinetics and induced large-voltage hysteresis of metal-air batteries. ...

NiFe-LDH with a flexible structure is relatively open and layered, which facilitated rapid penetration of reactants/products and fast electron transport efficiency; yet its low electric conductivity limited its potential commercialization. ... to fabricate smart fluorescent electrode materials for energy storage and electrocatalysis, for which ...

Increasing demands for energy conversion and storage, coupled with environmental concerns of global warming and fossil fuel depletion, have spawned intense exploration of renewables, alternative energy storage and conversion technologies based on supercapacitors, lithium/sodium ion batteries, metal-air batteries, fuel cells and electrocatalytic ...

The rapid development of portable and wearable electronics has triggered intensive research activities on various energy conversion and storage devices [1, 2]. Metal-air batteries, especially flexible Zn-air batteries (ZABs) have been considered as promising candidates owing to their high theoretical specific energy density (1084 Wh kg^{-1}), source ...

Formation energies, electrocatalysis potential, charge storage mechanisms, and future research directions for expansion of the MXene family and its novel properties are discussed. ... Multitasking MXene inks enable high-performance printable microelectrochemical energy storage devices for all-flexible self-powered integrated systems. Adv. Mater ...

Finally, the current challenges and future developments in nanocellulose-based composites for the next generation of flexible energy storage systems are proposed. 1 Introduction. With the rapid rise of implantable, wearable, and portable electronic devices on the commercial market, wearable electronic devices that appear as gadgets, accessories ...

1 Introduction. With the rapid increase in greenhouse gas emissions and the resulting serious climatic issues induced by the excessive use of traditional fossil fuels, clean energy conversion and storage technologies with net-zero emissions, such as $\text{H}_2\text{-O}_2$ fuel cells and metal-air batteries, have become the focus of widespread research efforts in recent years.

Benefiting from its surface-rich functional groups, eco-friendliness, impressive electrochemical properties,

excellent light absorption, structural tunability at the atomic/morphological level, and ultra-high stability under harsh conditions, nanodiamond has emerged as a promising carbon-based non-metallic material in the field of energy conversion ...

This review article underlines the most recent research advances on 2D MXene materials for clean energy conversion via electrocatalysis and photo-electrocatalysis namely ...

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