Semiconductor electrochemical energy storage

2.1 BatteriesBatteries are electrochemical cells that rely on chemical reactions to store and release energy (Fig. 1a).Batteries are made up of a positive and a negative electrode, or the so-called cathode and anode, which are submerged in a liquid electrolyte. The ...

Second-generation electrochemical energy storage devices, such as lithium-oxygen (Li-O2) batteries, lithium-sulfur (Li-S) batteries and sodium-ion batteries are the hot spots and focus of research in recent years[1,2]. Porous carbons are widely used in several ...

Correction to: Semiconductor Electrochemistry for Clean Energy Conversion and Storage Bin Zhu1 · Liangdong Fan2 · Naveed Mushtaq1 · Rizwan Raza3 · Muhammad Sajid3 · Yan Wu 4 · Wenfeng Lin 5 · Jung-Sik Kim ...

Between 2000 and 2010, researchers focused on improving LFP electrochemical energy storage performance by introducing nanometric carbon coating 6 and reducing particle size 7 to fully exploit the ...

This review further extends to semiconductor-based electrochemical energy conversion and storage, describing their fundamentals and working principles, with the intention of advancing the ...

This review will provide a comprehensive overview of MXenes for energy storage applications. o The emphasis on MXene''s chemistry, classifications, electronic and electrochemical features are discussed. o Modification of chemical and electrochemical properties of

Recently, two-dimensional transition metal dichalcogenides, particularly WS2, raised extensive interest due to its extraordinary physicochemical properties. With the merits of low costs and prominent properties such as high anisotropy and distinct crystal structure, WS2 is regarded as a competent substitute in the construction of next-generation environmentally ...

Nanostructured semiconductors have been researched intensively for energy conversion and storage applications in recent decades. Despite of tremendous findings and achievements, the performance of the devices resulted from the nanomaterials in terms of energy conversion efficiency and storage capacity needs further improvement to become economically ...

A new, sizable family of 2D transition metal carbonitrides, carbides, and nitrides known as MXenes has attracted a lot of attention in recent years. This is because MXenes exhibit a variety of intriguing physical, chemical, mechanical, and electrochemical characteristics that are closely linked to the wide variety of their surface terminations and elemental compositions. ...

The pursuit of energy storage and conversion systems with higher energy densities continues to be a focal

point in contemporary energy research. electrochemical capacitors represent an emerging ...

Nanostructuring is becoming key in controlling the electrochemical performance and exploiting various charge storage mechanisms, such as surface-based ion adsorption, pseudocapacitance, and diffusion ...

Semiconductors and the associated methodologies applied to electrochemistry have recently grown as an emerging field in energy materials and technologies. For example, semiconductor membranes and heterostructure fuel cells are new technological trend, which differ from the traditional fuel cell electrochemistry principle employing three basic functional components: ...

Electrocatalysis and photoelectrocatalysis (for energy conversion) as well as metal-ion batteries and supercapacitors (for energy storage) are selected to illustrate the superiorities of WDNs in electrochemical reactions and charge ...

Semiconductors will be the new horizon for the manufacturing of electrochemical energy storage devices. Semiconducting materials in association with facile synthesis technologies will further improve the qualities of the materials.

Two-dimensional black phosphorus (2D BP), well known as phosphorene, has triggered tremendous attention since the first discovery in 2014. The unique puckered monolayer structure endows 2D BP intriguing ...

Electrochemical energy storage technologies have a profound influence on daily life, and their development heavily relies on innovations in materials science. Recently, high-entropy materials have attracted increasing research interest worldwide. In this perspective, we start with the early development of high-entropy materials and the calculation of the ...

Herein, we discuss three dynamic interfacial phenomena in electrocatalysis among various electrochemical environments in energy conversion and storage systems, with a focus on the regeneration of active sites by interaction ...

In this contribution, we report a family of transparent semiconductor oxides with excellent energy storing capability. ... A. et al. Electrochemical energy storage devices for wearable technology ...

Supercapacitors (SCs) are a kind of energy storage that replaces conventional batteries and capacitors. Compared to capacitors, they can store more energy and supply power at a faster rate. Co3O4 nanoparticles have been employed in various products, including rechargeable Li-ion batteries, solar cells, supercapacitors, field effect transistors, field emission ...

Electrochemical energy conversion and storage are central to developing future renewable energy systems. For efficient energy utilization, both the performance and stability of electrochemical systems should be optimized

in terms of the electrochemical interface. To achieve this goal, it is imperative to understand how a tailored electrode structure and electrolyte speciation can ...

This simultaneous demonstration of ultrahigh energy density and power density overcomes the traditional capacity-speed trade-off across the electrostatic-electrochemical ...

This review further extends to semiconductor-based electrochemical energy conversion and storage, describing their fundamentals and working principles, with the intention of advancing ...

Adopting a nano- and micro-structuring approach to fully unleashing the genuine potential of electrode active material benefits in-depth understandings and research progress ...

Recent advanced experiments of magnetically enhanced electron transfer, spin state-dependent phenomena for electrochemistry. o Inclusive discussion on the effect of the magnetic field in the electrochemical energy harvesting and storage devices. o 2 o

The architectural design of electrodes offers new opportunities for next-generation electrochemical energy storage devices (EESDs) by increasing surface area, thickness, and active materials mass loading while maintaining good ion diffusion through optimized electrode tortuosity. However, conventional thick electrodes increase ion diffusion ...

This book focuses on novel electrochemical materials particularly designed for specific energy applications. It presents the relationship between materials properties, state-of-the-art processing, and device performance and sheds light on the research, development ...