

Electrocatalytic materials are considered energy storage materials

Can electrocatalytic materials be used for energy storage and conversion devices?

Developing new, improved electrocatalytic materials for batteries, supercapacitors, and fuel cell electrode reactions is expected to significantly impact device performance and, consequently, their commercialisation. The present special issue is focused on recent developments in electrocatalytic materials for energy storage and conversion devices.

What are the applications of electrocatalytic materials?

It covers cutting-edge studies and in-depth discussions on the applications of electrocatalytic materials in energy conversion and storage (including fuel cells, water splitting, batteries, etc.), sensors, and other potential applications. It also addresses the broader implications of electrocatalysis in academia and industry.

What are electrocatalytic materials?

This handbook focuses on electrocatalytic materials, a field that has experienced significant advancements in recent decades, primarily driven by nanoscale catalyst design improvements. These advancements have been crucial in the development and enhancement of alternative energy technologies relying on electrochemical reactions.

Which metals can be used for electrochemical energy storage?

The exploration of post-Lithium (Li) metals, such as Sodium (Na), Potassium (K), Magnesium (Mg), Calcium (Ca), Aluminum (Al), and Zinc (Zn), for electrochemical energy storage has been driven by the limited availability of Li and the higher theoretical specific energies compared to the state-of-the-art Li-ion batteries.

What are the different types of electrochemical energy conversion/storage devices?

Progress in electrochemical energy conversion/storage devices takes three directions: batteries, supercapacitors, and fuel cells. Batteries find wide applications in portable devices, including laptop computers, mobile phones and cameras.

Why is electrocatalytic technology important?

Electrocatalytic techniques are considered to be an efficient way for energy conversion and storage, which can alleviate the energy crisis and environmental pollution. Designing and synthesizing electrocatalysts with high catalytic activity and selectivity have become a research hotspot.

These characteristics make them appealing candidates for effective energy storage and electrocatalytic energy conversion applications. This review explores the recent ...

Over the last few decades, efficient energy conversion and storage technologies with remarkable sustainability are greatly desired due to the challenge of rapid increasing ...

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The MOF-based materials discussed here are divided into three categories: pristine MOFs, MOF composites and their derivatives. For every category of materials, electrocatalytic ...

Carbon-derived nanomaterials have been considered as emergent materials owing to their exceptional chemical and physical characteristics such as high thermal and electrical ...

Because of the demand for clean and sustainable energy sources, nanocarbons, modified carbons and their composite materials derived from metal-organic frameworks ...

Hydrogen production employing non-carbon materials has tremendous promise toward the sustainable Future. Conventional technology relies on water splitting (WS) for ...

Schematic illustration of some of the most promising methods applied to the synthesis of doped graphene materials for energy storage and conversion devices. For each ...

Herein, the latest progresses in MOF-derived N, P, S-doped materials for energy storage and conversion, including electrocatalytic water splitting, fuel cells, supercapacitors ...

Water splitting for hydrogen production is the main component of contemporary clean energy technology [3]. However, the practical application of water splitting is less ...

Since then, electriles have attracted growing interest, with research efforts focusing on the development of novel, stable electrile materials and their application in a broad range ...

Layered double hydroxides (LDHs), also known as hydrotalcite-like layered materials, are a family of two-dimensional material with unique host-guest intercalated ...

Because of accelerating global energy consumption and growing environmental concerns, the need to develop clean and sustainable energy conversion and storage systems, such as fuel cells, dye-sensitized solar cells, ...

Inspired by the discovery of graphene in 2004 [35], 2D materials, such as graphitic carbon nitride (CN_x), transition metal dichalcogenides (TMD), transition-metal oxides (TMOs), ...

This review primarily focuses on the SECM methodology for analyzing electrocatalytic reactions within energy conversion and storage systems, specifically in ...

The blooming emergence of graphdiyne featuring embellished sp-hybridized carbons has been highly alluring for electrocatalysis and ion storage. Here, a porous 3D ...

Carbon-based materials are widely studied for their unique advantages in electrocatalysis. Despite significant

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progress, the precise interface constru...

Electrocatalytical techniques are considered to be an efficient way for energy conversion and storage, which can alleviate the energy crisis and environmental pollution. ...

Porous metals, metal oxides, carbon, and their multi-component hybrids are promising materials for different energy conversion applications, storage, remediation, etc. ...

Advances and perspectives of ZIFs-based materials for electrochemical energy storage: design of synthesis and crystal structure, evolution of mechanisms and ...

By evaluating the electrocatalytic performance of catalytic materials tuned at the mesoscale, we paint a picture of how these factors at different levels affect the final system ...

An understanding of functional materials of this kind and the catalytic processes in which they'll necessarily be incorporated has never been more essential. Functional Materials ...

Transition metal sulfide (TMS), due to its open framework structure and unique semiconductor properties, provides a nice passage for charge transfer and improves ...

Several candidates have been proposed to reduce the cost of using precious metal catalysts without degrading their high performance. Stainless steel has attracted attention as ...

Advanced Electrocatalytic Materials for Energy and Environmental Applications ... (ZHCs) combining merits of battery-type and capacitive electrodes are considered to be a prospective candidate in energy storage systems. ...

The electrocatalytic process plays a key role in energy generation (fuel and energy), energy storage, energy recycling, and other processes [3]. The increasing consumption of ...

The graphene successfully peeled from graphite in 2004 aroused tremendous research interests in two-dimensional (2D) nanomaterials, due to their unusual physical and ...

The aim to produce highly active, selective, and long-lived electrocatalysts by design drives major research efforts toward gaining fundamental understanding of the relationship between material properties ...

The TMN-based electrocatalytic materials have demonstrated great potential for advanced electrocatalysis and green energy conversion and storage techniques. The decent ...

We review the emerging 2D carbonaceous materials for electrocatalysis, focusing primarily on the fine

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engineering of active structures through thermal condensation, where the design, fabrication, and mechanism ...

Developing new, improved electrocatalytic materials for batteries, supercapacitors, and fuel cell electrode reactions is expected to significantly impact device performance and, ...

Lithium-air batteries (LABs) present a promising solution for future energy storage due to their exceptional energy density and potential to address imminent energy and ...

The exploration of post-Lithium (Li) metals, such as Sodium (Na), Potassium (K), Magnesium (Mg), Calcium (Ca), Aluminum (Al), and Zinc (Zn), for electrochemical energy ...

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