

# Principles and applications of solid-state hydrogen energy storage technology

Abstract Storage of hydrogen is necessary to fully exploit it as a clean energy source. This study provides a comprehensive analysis of the state of hydrogen storage technologies, including ...

Glass microspheres, with their unique internal structure and chemical stability, offer a promising solution for the challenges of hydrogen storage and transmission, potentially ...

We also address the primary challenges and provide future perspectives on the development of nanomaterial-based hydrogen storage technologies. Key discussions include ...

Abstract Solid-state storage of hydrogen molecules in carbon-based light metal single-atom materials is promising to achieve both high hydrogen storage capacity and uptake ...

The global energy transition towards a carbon neutral society requires a profound transformation of electricity generation and consumption, as well as of electric power systems. ...

Storage strategies encompass compressed gas, liquid, and solid-state methods, each with unique characteristics and use cases. Mainstream hydrogen applications involve fuel cells, hydrogen ...

As hydrogen technology continues to advance, solid-state hydrogen storage materials have garnered significant attention as an efficient solution for hydrogen energy ...

First-principles methods accurately compute crucial physical quantities relevant to hydrogen storage materials, such as the free energy of hydrogen storage/release reactions ...

Solid-state hydrogen storage technology has emerged as a disruptive solution to the "last mile" challenge in large-scale hydrogen energy applications, garnering significant ...

Abstract Hydrogen energy, known for its high energy density, environmental friendliness, and renewability, stands out as a promising alternative to fossil fuels. However, its broader ...

This review provides an in-depth analysis of the research progress of solid-state hydrogen storage materials in the last decade, such as hydrogen storage mechanism, thermodynamic properties ...

Electrolysis, for instance, involves using electricity to split water into hydrogen and oxygen, offering a clean method of hydrogen production, especially when powered by renewable ...

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Solid-state hydrogen storage is among the safest methods to store hydrogen, but current room temperature hydrides capable of absorbing and releasing hydrogen at the ...

Solid-state storage technology, including photothermal hydrogen storage, stands out as potential for increased storage efficiency, safety, and scalability in applying renewable ...

Hydrogen is one of the cleanest energies with potential to have zero carbon emission. Hydrogen storage is a challenging phase for the hydrogen energy application. The ...

The development of novel solid-state electrolytes is crucial for advancing high-performance solid-state batteries. However, the fast-charging capability and low-temperature performance of ...

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