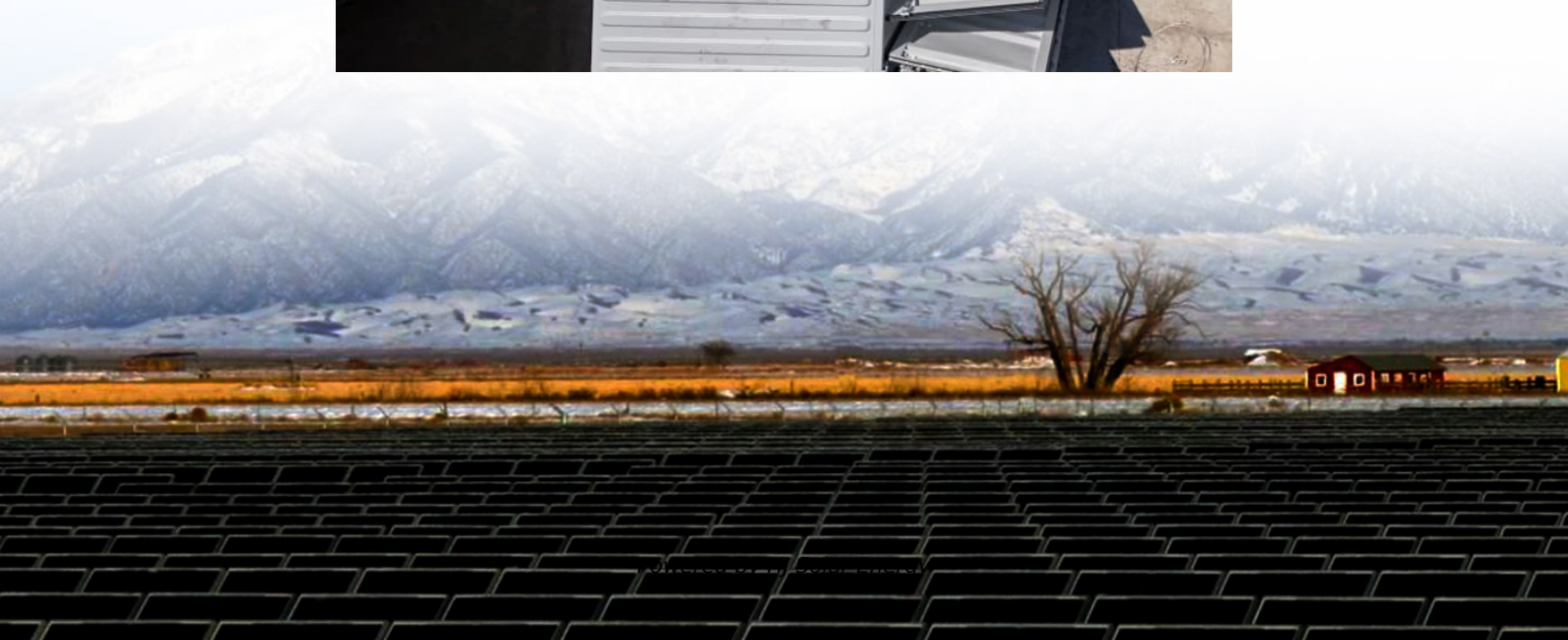


Energy storage mineral materials





Overview

Mineral composite material is a cross-field of mineralogy and composite material that has emerged in recent years. These materials have specific functional properties of minerals and the unique characteristics of composite materials. Energy-related materials are currently a research hotspot. However, a systematic review of energy storage and energy catalysis in composite materials from natural minerals is few. Mineral composite materials have the following advantages. (1) Minerals are natural composite materials conducive to ecological civilization construction. (2) Mineral resources are abundant on the Earth, which means pronounced cost reduction in composite materials. (3) Mineral-derived tailings wastes can be comprehensively turned into treasure. This study presents the advances in energy storage and catalysis applications of composite materials from a mineral composite perspective.

First, we discussed this discipline's evolution, the development process, and classified mineral composite materials. Second, we introduced the applications of mineral composites in the field of energy storage, such as piezoelectric self-power generation, supercapacitors, and secondary batteries. Finally, we summarized the applications of mineral composites in the domain of energy catalysis, including electrocatalysis, energy photocatalysis, and pyroelectric/piezoelectric catalysis.

The regulation of mineral functions or auxiliary units can significantly improve energy storage and catalytic activities. Specifically, the mineral loading/recombination strategy for photocatalytic applications helps inhibit the recombination of photo-generated carriers and enhance their light absorption. Stripping the mineral ore and forming a composite material for energy electrocatalysis are beneficial in exposing its active catalytic sites and reducing the activation energy required for hydrogen evolution reaction applications.

Mineral composite materials have evolved from mechanical functional mineral composite materials to multi-functional mineral composite materials. However, numerous problems remain on the path to scientific research and industrialization, such as batch preparation and mineral composites' stability. We conclude that strengthening the practical design of multi-functional mineral composites enables us to understand the mechanism of mineral composite materials by combing crystal structure design, physical and chemical characterizations, and theoretical calculation/simulation. Further, we presented future scientific



challenges and development opportunities for mineral composite materials.



Energy storage mineral materials



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Some of these technologies include solar photovoltaic energy, wind energy, grid-scale storage batteries, and electric vehicles (EVs). The increase in demand for new technologies ...

MATERIALS FOR ENERGY STORAGE

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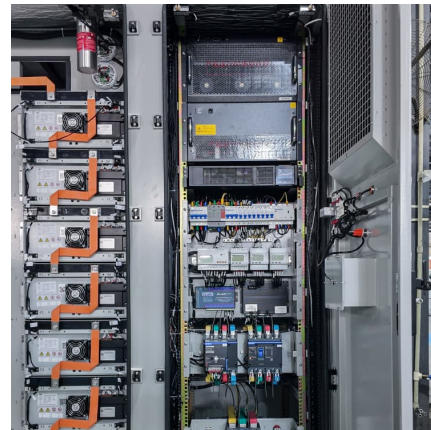
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Energy Storage Materials

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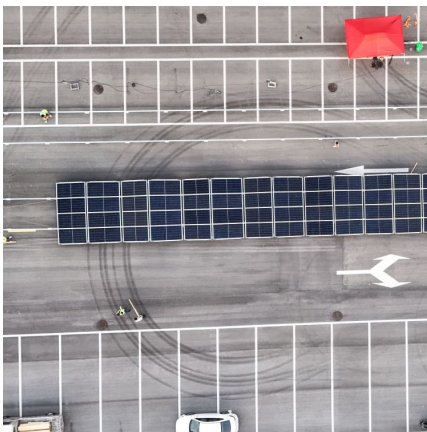
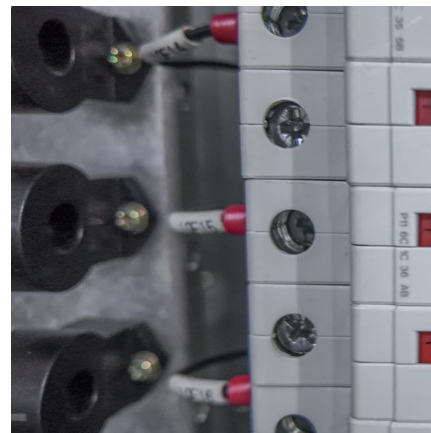


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