

What is photothermal phase change energy storage?

To meet the demands of the global energy transition, photothermal phase change energy storage materials have emerged as an innovative solution. These materials, utilizing various photothermal conversion carriers, can passively store energy and respond to changes in light exposure, thereby enhancing the efficiency of energy systems.

What are the applications of photothermal materials?

Explore the broad spectrum of applications for photothermal materials, including their transformative roles in photothermal catalysis, sterilization and therapy, desalination, and the generation of electric energy through photothermal conversion.

How do photothermal materials optimize solar energy utilization?

To optimize solar energy utilization, photothermal materials are engineered to maximize incident solar radiation absorption, while minimizing losses due to transmission and reflection. Furthermore, these materials are designed to convert absorbed photon energy into thermal energy efficiently.

Can photothermal materials revolutionize information storage?

Looking ahead, the potential applications of photothermal materials extend beyond their current mainstream uses. These materials, responsive to light-induced temperature changes, are poised to revolutionize sectors like sensing and actuation, as well as information storage.

How to improve thermal management in photothermal conversion systems?

Effective thermal management is essential in enhancing the efficiency of photothermal conversion systems, which convert solar energy into thermal energy. Here, we discuss strategies to improve thermal management by focusing on insulation, heat transfer mechanisms, and materials selection.

How efficient are photothermal materials?

Studies on conventional photothermal materials are mainly single-component based and lack material and structural design, so their photothermal conversion efficiency are generally low.

Particularly, photothermal energy storage systems that store excess solar energy generated during the day for nighttime utilization are widely adopted. ... successfully engineered highly directional graphene aerogels through the utilization of the directional freezing template method, culminating in the development of a phase change composite ...

Semantic Scholar extracted view of "Advanced Polyvinylpyrrolidone-Bridged Mxene Skeleton Constructed by Photothermal Assisted Sacrificial Template Method for Phase Change Materials with Form Stability and Photothermal Conversion"; by Yuanzhou Chen et al. ... Magnetically accelerated thermal

energy storage within Fe₃O₄-anchored MXene-based ...

The global energy transition requires new technologies for efficiently managing and storing renewable energy. In the early 20th century, Stanford Olshansky discovered the phase change storage properties of paraffin, advancing phase change materials (PCMs) technology []. Photothermal phase change energy storage materials (PTPCESMs), as a ...

1 INTRODUCTION. Renewable, abundant, and clean solar energy is expected to replace fossil fuels and alleviate the energy crisis. However, intermittency and instability are the deficiencies of solar energy due to its weather and space dependence. [] Emerging phase change material (PCM)-based photothermal conversion and storage technology is an effective ...

Solar photothermal conversion and energy storage systems can effectively solve the imbalance between the supply and demand of solar energy utilization in space and time. ... large pores might have originated from the gas produced during the combustion of the carbon ball template, breaking the shell layer during the calcination process. By ...

High latent heat and recyclable form-stable phase change materials prepared via a facile self-template method. Chem. Eng. J. (2020) ... Biodegradable wood plastic composites with phase change microcapsules of honeycomb-BN-layer for photothermal energy conversion and storage. Chemical Engineering Journal, Volume 448, 2022, Article 137218.

Abstract Multifunctional phase change materials-based thermal energy storage technology is an important way to save energy by capturing huge amounts of thermal energy during solar irradiation and releasing it when needed. Herein, superhydrophobic thermal energy storage coating is realized by spraying mesoporous superhydrophobic C@SiO₂-HDTMS ...

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