



Photothermal energy storage pioneer

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 is the photothermal conversion and storage efficiency of ODA@MOF/PPy-6%?

Importantly, the photothermal conversion and storage efficiency of ODA@MOF/PPy-6% is up to 88.3%. Additionally, our developed MOF-based photothermal composite PCMs also exhibit long-standing antileakage stability, energy storage stability, and photothermal conversion stability.

What is PCM based photothermal conversion and storage system?

The PCM-based photothermal conversion and storage system is composed of photothermal conversion unit (PPy), latent heat storage unit (ODA), and supporting framework (MOF). High content (6%) of PPy is more conducive to the improvement of these thermophysical properties of ODA@MOF/PPy composite PCMs.

What is photothermal conversion efficiency?

These carriers are primarily focused on enhancing photothermal conversion rates, while also improving thermal conductivity, sealability, and the control of thermal radiation intensity in PCMs. For commonly used PTCPCESM, the photothermal conversion efficiency is required to be above 50% to 70%.

How does photothermal heat release work?

This device effectively controls temperature through photothermally driven heat release under conditions as low as $-40\text{ }^{\circ}\text{C}$ and achieves a high energy density of 380.76 J/g even at $-63.92\text{ }^{\circ}\text{C}$. The thermal effect is primarily due to light-induced molecular isomerization, a nonradiative relaxation process.

Can CNT sponge be used for photothermal conversion?

Zhang and Liu used CNT sponge to prepare sebacic acid/CNT sponge composite PCM for photothermal conversion. Expect single photoresponsive materials, photoresponsive hybrid materials for PCMs are expected to harvest more excellent photothermal conversion capabilities.

The photothermal storage method that uses the chemical structure of photosensitive molecules to store energy has received a lot of attention in recent years [23].

A photothermal anti-icing surface with sustainable evaporation by the synergistic action of photothermal, energy storage, and hydrophilicity is proposed. It can achieve rapid evaporation of droplets ...

Enormous challenges still seriously restrict the application of phase change materials (PCMs) in thermal



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energy storage and heat management systems, such as their ...

Herein, we prepared high-performance pristine MOF-based photothermal composite PCMs by simultaneously integrating photon absorber guest (polypyrrole [PPy]) and thermal storage guest (1 ...

Phase change materials (PCMs) are a crucial focus of research in the field of photothermal energy storage. However, due to their inherently low photothermal conversion efficiency, traditional ...

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 phase change energy storage materials show immense potential in the fields of solar energy and thermal management, particularly in addressing the intermittency issues of ...

The thermal properties of MPCMs were investigated by DSC, TGA, UV-Vis-NIR absorption spectra and cooling tests. Paraffin@Hectorite-SiO₂/Fe₃O₄-Water LHF ...

Herein, a photothermal energy-storage capsule (PESC) by leveraging both the solar-to-thermal conversion and energy-storage capability is proposed for efficient anti-/deicing.

The obtained PCM microcapsules have good thermal stability and durability, with a PCM core content of up to 88.9% and a phase change enthalpy of 214.3 J g⁻¹, which is expected to be ...

This paper proposes a molecular model of covalent grafting of azobenzene derivatives with graphite-like carbon nitride based on hydrogen bond regulation to improve the azobenzene ...

In summary, our innovative strategy effectively boosts the light absorption coefficient of Pe biomass while preserving its high porosity, providing a feasible solution for the large-scale and expedited ...

Synergistic enhancement of photothermal energy storage capacity of polyethylene glycol by polydopamine and nano-copper particles ...

Moreover, we have introduced an advanced high-photothermal conversion layer that synergizes with our directionally conductive phase change composite. This strategic ...

Solar energy provides an alternative, sustainable, and clean source of energy to meet the global energy demands without extra carbon emissions. However, the utilization ...

A review on solar thermal energy storage systems using phase-change materials Phase Change Materials for Thermal Energy Storage Numerical simulation effect of ...



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The solar-heat storage efficiency of devices based on phase change materials (PCMs) is limited due to the light absorption and internal heat transfer within the PCMs, unclear ...

Abstract Infiltrating phase change materials (PCMs) into nanoporous metal-organic frameworks (MOFs) is accepted as a cutting-edge thermal energy storage concept. However, weak photon ...

In this review, Ding and colleagues summarize the functioning principles and categories of photothermal catalysis, catalyst design criteria and strategies, and recent progress in applying ...

Here, Co_3O_4 - $\text{Co}_3(\text{PO}_4)_2$ nanoparticles were verified to be excellent full-wavelength absorbers and able to improve the photothermal temperature, photothermal ...

Photons can be absorbed by the energy storage process of PCMs, which exhibits the excellent photo-thermal energy storage characteristic, then stored in the way of internal ...

All forms of energy follow the law of conservation of energy, by which they can be neither created nor destroyed. Light-to-heat conversion as a traditional yet constantly evolving means of converting light into ...

Photothermal catalysis, a frontier in heterogeneous catalysis, combines light-driven and thermally enhanced chemical reactions to optimize energy use and reaction efficiencies at catalytic active sites. ...

A photothermal energy storage phase change material with high stability and enthalpy. RSC Advances (IF 4.6) Pub Date : 2025-05-21, DOI: 10.1039/d5ra01422k Shenghua Xiong 1, 2, ...

In this study, we prepared CNT-BN-SA-1, a photothermal phase change energy storage material with excellent stability, long life, and high enthalpy value. The Hm of CNT-BN ...

The presence of a phase transition plateau was observed in both PPCu-2 and PPCu-1, which is believed to be caused by the liberation of stored thermal energy, indicating ...



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