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.

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.

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.

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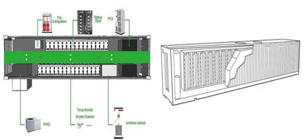
What is photothermal conversion? Photothermal conversion delineates the transformation of solar radiation (light energy) into thermal energy (heat),which subsequently can be harnessed to actuate devices or generate electricity. The photothermal conversion process,integral to electric energy generation,unfolds through a sequenced methodology ,:

Nanoparticles have been thoroughly investigated in the last few decades because they have many beneficial and functional qualities. Their capability to enhance and manipulate light absorption, thermal conductivity, and heat transfer efficiency has attracted significant research attention. This systematic and comprehensive work is a critical review of ???

Energy charging process. In a dark room, trans-crystal powder samples were set on a 24 x 24 mm glass slide.The slide was set on a constant temperature heating platform that simulated the ambient heat (T 1).The sample was then irradiated with 365-nm wavelength light (80 Mw/cm 2, 5 cm away) until the trans-crystal was converted into the cis-liquid through ???

Here, novel photothermal conversion and energy storage composite was designed and fabricated to solve the problem. Firstly, nanoscale poly (p-phenylenediamine) (PPPD) as stabilizer and photothermal conversion material was synthesized and used in the encapsulation of lauryl myristate as phase change material (PCM) with phase change ???



The composite photothermal PCM has robust full-spectrum absorption and highly efficient photothermal conversion capability, realizing both thermal energy storage and photothermal conversion, and it will be expected to have a promising future in the field of solar energy storage and conversion, and human thermal therapy.

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The obtained CA-SA/Nano-SiO 2 @LEW CPCM has improved energy storage density, photothermal conversion ability, and its preparation schematic diagram is shown in Fig. 1 a and 1 b. In addition, the hydrophobic and antibacterial properties are also improved [23]. The parameters of CPCM were imported into the DesignBuilder software to build a house

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 solar power. Their multifunctionality and efficiency offer broad application prospects in new energy technologies, construction, aviation, personal thermal

So far, bio-materials have been extensively studied in preparing PCCs. For example, Xie et al. [18] devised a series of PCCs with excellent photothermal conversion and thermal energy storage capabilities by PDA-modified biomass radish foam while enabling the effective encapsulation of the PCM inside the radish foam.

Importantly, the prepared composite PCMs, with a controllable melting temperature of 573.2???654.2 ?C, thermal energy storage density of 30.9???37.3 J/g, great repeatable utilization performance

To obtain a novel phase-change material with high enthalpy and long endurance for photo-thermal energy storage, multi-walled carbon nanotubes and h-BN were modified to form carboxylated supporting materials for HA, which have hydroxyl groups. The results of Fourier transform infrared spectroscopy and thermogravimetric analysis suggested the interaction ???

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Phase change materials (PCMs) are considered one of the most effective carriers for storing solar energy due to their excellent performance in absorbing and releasing latent heat during melting and crystallization processes [10] anic solid???liquid PCMs have received widespread attention due to their high energy storage density, good chemical ???


Currently, fossil fuel resources are being gradually depleted, and the world is facing a severe energy crisis. Efforts are being made to promote energy transition, enhance energy utilization efficiency and replace non-renewable energy with sustainable alternatives [1, 2].Solar energy has gained widespread attention thanks to its continuous energy supply and ???

The photothermal conversion and storage mechanism of the ND/SiO 2 NEPCM is illustrated in Fig. 9, primarily attributed to the thermal vibrations of molecules combined with the optical confinement effect of the ND/SiO 2 hybrid shells, as well as the phase change thermal energy storage capacity provided by n-Octadecane. In brief, solar energy is


For example, photothermal energy is susceptible to the weather, and stable power output in all weather conditions can be achieved by coupling with other heating strategies or using a thermal storage device. For the applications involving the evaporation process, environmental factors beyond solar intensity,


Direct-photothermal energy conversion and storage experiment: The 300 W Xe-lamp was used as the solar simulator in the direct-photothermal energy conversion and storage experiment with the intensity adjusted from 0.5 to 2 kW/m 2. During the experiment, the thermocouple was attached to the surface at different positions of the SA-PCB-20 to

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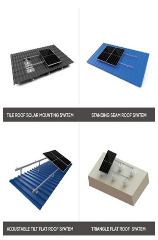
To meet the requirement of multipurpose applications in infrared thermal camouflage and solar photothermal energy storage, we have developed a series of multifunctional composite films based on polyurethane (PU) as a flexible matrix and double-layered phase-change microcapsules as an additive. The double-layered microcapsules were first ???

tantly, 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. The proposed coating

Here, novel photothermal conversion and energy storage composite was designed and fabricated to solve the problem. Firstly, nanoscale poly (p-phenylenediamine) (PPPD) as stabilizer and

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. Under



This paper aims to improve the photothermal energy storage performance of the composite material by preparing AZO-g-C 3 N 4 material with hydrogen bonds. The isomerization enthalpy values of azobenzene derivatives and azobenzene/graphite-like carbon nitride materials were calculated using density functional theory.

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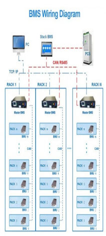
The rapid growth in energy demand, declining fossil fuel reserves and the projected energy crisis have forced the scientific community to reassess its research priorities and shift toward alternative, viable and environmentally friendly energy sources [1].Different types of energy technologies, including thermoelectric power generation, solar photovoltaic, solar ???


The integrated photothermal phase change energy storage materials prepared in this study can further enhance the utilisation of solar energy. The composite PCMs can not only increase the total energy storage capacity of the solar energy storage system but also stabilise the heat output temperature. Specifically, solar energy is stored during


gap can lead to energy loss through photon emission. Hence, the band-gap width of semiconductors can crucially determine the photothermal conversion ef???ciency. For the semiconductors with narrow band gap, the energy of most photons from sunlight is higher than the band-gap energy, leading to the production of elec-tron-hole pairs above the



Particularly, photothermal energy storage systems that store excess solar energy generated during the day for nighttime utilization are widely adopted. Stearic acid (SA) has garnered significant attention as a recommended PCM due to its favorable properties [5], [6], such as cost-effectiveness, high thermal storage density, non-toxicity, and


As seen from the photothermal conversion and storage curves (Fig. 3 e), PEG@EG/PPy composite PCMs exhibit typical photothermal conversion and storage behavior under light radiation. Specifically, when the light switch is turned on, light energy is absorbed by EG/PPy and then converted into thermal energy in the form of sensible heat.

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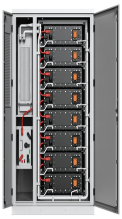


The prepared composites with excellent shape stability present favorable thermal energy storage in photothermal conversion and thermal modulation technologies. Li et al. [7] synthesized a highly innovative conductive and photothermal phase change composite (PCC) by vacuum impregnation using a modified carbon black as a substrate. The as


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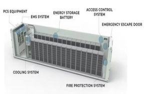

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