Cairo photothermal phase change energy storage

Pristine organic phase change materials (PCMs) are difficult to complete photothermal conversion and storage. To upgrade their photothermal conversion and storage capacity, we developed Fe-MOF (metal-organic framework) derived Fe 3 O 4 /C-decorated graphene (GP) based composite PCMs toward solar energy harvesting. Graphene is an ...

Phase change materials (PCMs) are considered one of the most promising energy storage methods owing to their beneficial effects on a larger latent heat, smaller volume change, and easier controlling than other materials. PCMs are widely used in solar energy heating, industrial waste heat utilization, energy conservation in the construction industry, and ...

Thermal energy storage (TES) is essential for solar thermal energy systems [7].Photothermal materials can effectively absorb solar energy and convert it into heat energy [8], which has become a research hotspot.Phase change materials (PCM) with high energy density and heat absorption and release efficiency [9], have been widely used in many fields as ...

Thermal energy storage (TES) techniques are classified into thermochemical energy storage, sensible heat storage, and latent heat storage (LHS). [1 - 3] Comparatively, LHS using phase change materials (PCMs) is considered a better option because it can reversibly store and release large quantities of thermal energy from the surrounding ...

The research on phase change materials (PCMs) for thermal energy storage systems has been gaining momentum in a quest to identify better materials with low-cost, ease of availability, improved thermal and chemical stabilities and eco-friendly nature. The present article comprehensively reviews the novel PCMs and their synthesis and characterization techniques ...

Pristine organic phase change materials (PCMs) suffer from liquid leakage and weak solar absorption in solar energy utilization. To address these deficiencies, we prepared polypyrrole (PPy)-coated expanded graphite (EG)-based composite PCMs for photothermal conversion and storage through chemical polymerization and physical infiltration methods.

Abstract Phase change materials (PCMs) can alleviate concerns over energy to some extent by reversibly storing a tremendous amount of renewable and sustainable thermal energy. ... 2D graphene is a promising candidate for enhancing the thermal conductivity and photothermal and electrothermal conversion efficiency of composite PCMs. In addition ...

Photothermal phase change energy storage materials (PTCPCESMs), as a special type of PCM, can store

energy and respond to changes in illumination, enhancing the efficiency of energy systems and demonstrating marked potential in solar energy and thermal ...

Compared with the thermal curing process, the photocuring process has advantages such as high efficiency and less energy consumption. However, the preparation of photocurable phase change materials (PCMs) with photothermal conversion and self-cleaning properties is challenging due to the conflict between the transparency required by the ...

Solar energy is a high-priority clean energy alternative to fossil fuels in the current energy landscape, and the acquisition, storage, and utilization of solar energy have long been the subject of research [[1], [2], [3], [4]].The development of new materials has facilitated the technique for utilizing solar energy [5], such as phase change materials (PCMs), which have ...

Finally, the photothermal energy conversion and storage performance were measured using a simulated sunlight device combined with an infrared camera. The phase change nanocapsules incorporated with ND would be an effective strategy for improving their light absorption, conversion, and storage performance. ... as well as the phase change thermal ...

DOI: 10.1016/j.cej.2024.149281 Corpus ID: 267449381; Weavable coaxial phase change fibers concentrating thermal energy storage, photothermal conversion and thermochromic responsiveness toward smart thermoregulatory textiles

More than 70% of global primary energy input is wasted as heat, about 63% of which occurs as low-grade heat below 100°C. 1 Although pyroelectric technology can convert such low-grade heat into high-grade electric energy, the energy conversion efficiency is always lower than 2% by economically viable means. 2 In consideration of the huge demand of low ...

Latent heat thermal energy storage based on phase change materials (PCM) is considered to be an effective method to solve the contradiction between solar energy supply and demand in time and space. ... Optimization of supercooling, thermal conductivity, photothermal conversion, and phase change temperature of sodium acetate trihydrate for ...

In this work, smart thermoregulatory textiles with thermal energy storage, photothermal conversion and thermal responsiveness were woven for energy saving and personal thermal management. Sheath-core PU@OD phase change fibers were prepared by coaxial wet spinning, different extruded rate of core layer OD and sheath layer PU was investigated to ...

Phase change materials (PCMs), both organic and inorganic, store and release energy through a phase change process, which is the green carrier for maintaining or prolonging heat [[5], [6], [7]].A large number of studies have proved that PCMs is conducive to improving the utilization rate of solar energy as solving the

shortcomings of solar energy time and space ...

can passively store energy and respond to changes in light exposure, thereby enhancing the efficiency of energy systems. 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.

The photothermal conversion efficiency (g) is calculated as the ratio of the latent heat-storage energy to the solar irradiation energy throughout the phase-change process as follows [10]: (4) g (%) = m D H m A P D t × 100 where m is the mass of the samples, D H m is the melting enthalpy of the samples, D t is the time for the sample to ...

Solid-liquid phase-change materials (PCMs) are a type of latent heat-storage material. They can absorb and store a large quantity of thermal energy from different heat sources, such as solar and waste heat, and release it in a small range of temperature fluctuation through reversible solid-liquid phase transitions [1, 2] ch a distinguished feature enables ...

The development of phase change materials (PCMs) with high energy storage density, enhanced photothermal conversion efficiency and good form-stability is essential for practical application in utilization of solar energy. Herein, novel PCM composites (CPPCMs) with extremely high energy storage density and superb solar-thermal conversion performance were ...

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