Phase change energy storage fiber window picture

Integrating phase change materials (PCMs) into stimuli-responsive fibers offers exciting opportunities for smart clothing to realize instant energy conversion/storage and temperature regulation. However, the production of flexible and efficient smart energy storage fiber is still challenging.

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 ...

Phase change materials (PCMs) have shown promising applications for thermal energy storage and management. With the purposes of solving the critical leakage problem and improving the thermal conductive property of paraffin PCM, composite PCMs as-supported by carbon fiber bundles were fabricated by a simple vacuum impregnation.

Flexible shape-stabilized composite phase change materials (ss-CPCMs) have a wide range of potential applications because they can be woven into desired shapes. In this work, a series of novel flexible paraffin/multi-walled carbon nanotubes (MWCNTs)/polypropylene hollow fiber membrane (PHFM) ss-CPCMs (PC-PHFM-CPCMs) with weavability were fabricated for ...

2 · When the sun rises, temperature increases, the added phase-change material becomes transparent and the room can be lit up, so it"s like a "smart" window," Yujiao ...

Phase change material (PCM) has drawn much interest in the field of thermal energy storage (TES) such as waste heat recovery [5], solar energy utilization [6], thermal conserving and insulation buildings [7], electric appliance thermoregulation [8] and thermal comfortable textiles [9, 10], because it can store a large amount of thermal energy ...

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 ...

Phase change materials (PCMs) have attracted tremendous attention in the field of thermal energy storage owing to the large energy storage density when going through the isothermal phase transition process, and the functional PCMs have been deeply explored for the applications of solar/electro-thermal energy storage, waste heat storage and utilization, ...

The distinctive thermal energy storage attributes inherent in phase change materials (PCMs) facilitate the

reversible accumulation and discharge of significant thermal energy quantities during the isothermal phase transition, presenting a promising avenue for mitigating energy scarcity and its correlated environmental challenges [10].

Phase change materials (PCMs) can alleviate concerns over energy to some extent by reversibly storing a tremendous amount of renewable and sustainable thermal energy. However, the low ...

Consequently, intelligent PCFs with comfortable properties, temperature regulation capabilities, and energy storage performances are favourable for daily life. In general, a phase change working substance is flowable and amorphous above the phase change temperature, whereas, it is rigid, brittle, and fragile below the melting point [11 ...

The phase change fibers (PCFs) are considered as smart materials that containing phase change materials (PCMs) [10], a group of materials that have an intrinsic capability of absorbing and releasing heat during phase transition cycles, on the surface of fibers or inside fibers to adjust their surrounding temperature, which can be widely used for effective ...

Organic phase change materials (PCMs) are promising thermal energy storage materials owing to their high energy storage and release capacities, high chemical stability, repeatable utilization, proper phase change temperature and abundance in natural resources [, , , , ,].

Among them, the phase change medium loading in the phase change fiber with wet spinning is up to 70 wt.%, while the fiber strength is below 2.12 cN/dtex. In contrast, phase change fiber prepared by melt spinning achieves a breaking strength of up to 37.31 cN/dtex, but with an enthalpy of only 8.48 kJ/kg.

Phase change material for solar-thermal energy storage is widely studied to counter the mismatch between supply and demand in solar energy utilization. Here, authors introduce optical waveguide to ...

Herein, this work introduces a novel multifunction magnetic phase change fiber (MPCF), which integrates phase change, magnetic responsiveness, and photothermal conversion capabilities through a straightforward melting spinning process. In detail, the phase change capsules with a paraffin wax (PW) core and a unique SiO 2 -Fe 3 O 4 double-layer ...

A hierarchical porous carbon fiber-based phase change sheet is fabricated in large-scale. ... and then put back into the oven to be heated up for 100 times. The phase change energy storage material in the composites did not leak significantly after 100 cycles, indicating that the activated carbon fiber felt has good encapsulation performance ...

Herein, we have used a hollow fiber membrane as a support layer material to encapsulate paraffin in order to prepare a phase change energy storage material. The phase change energy storage materials with three

different support layers were successfully prepared and various properties were systematically characterized. There are also few reports ...

A novel thermoplastic polyurethane (TPU) PCFs possessing a high loaded ratio and high elasticity was simply prepared by vacuum absorption following wet spinning, then coated by waterborne polyurethane (WPU). Octadecane (OCC), hexadecanol (HEO), and stearic acid (SA), which have different tendencies to form hydrogen bonds with TPU, were selected as ...

Phase change materials (PCMs) can alleviate concerns over energy to some extent by reversibly storing a tremendous amount of renewable and sustainable thermal energy. However, the low thermal conductivity, low electrical conductivity, and weak photoabsorption of pure PCMs hinder their wider applicability and development.

Although the warmth retention of cotton fabric is better than that of PET fabric, it is still different from CNF1-PE/PW phase change fiber. Fig. 6 f presents the temperature cycling curve of the CNF 1-PE/PW phase-change fabric between room temperature (26.5 °C) and 60 °C, showing no obvious attenuation after 50 cycles.

With the increasing environmental pressure and energy demand, tremendous interest has been focused on the exploration of sustainable and environmental-friendly energy sources [[1], [2], [3], [4]].Among them, phase change materials (PCMs) that could absorb and release latent heat during the phase transformation have attracted numerous attention of ...

Leakage experiments determine the optimal mass fraction of PEG when mass fraction of EG was greater than 7 wt%, indicating the largest mass fraction without leakage for the phase change energy storage material. Composite PCMs retained a high level of latent heat of phase change (>150 J/g), and greatly improved the supercooling of PEG.

Recently, Niu et al. [95] presented phase change fibers with tunable phase change temperature and high energy storage capacity. They prepared fibers of polyurethane/ CNT/lauric acid by wet ...

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Investigating their photo-to-heat response, the study focused on low ... signifying effective photoheat conversion and storage along the single fiber despite the cold environment. ... of MEPCM capsules/fibers in terms of morphology, encapsulation ratio, particle size distribution, thermal conductivity, phase change energy storage properties ...

Phase change energy storage fiber window picture

A facile and novel wet spinning method was used to prepare phase change fibers. Ag nanoflowers and PEDOT:PSS coating enabled the fiber high electrical conductivity. The fiber exhibited photo-/electro-responses with high energy conversion and storage. The smart energy storage fiber performed effective energy conversion underwater.

Photo-thermal conversion phase-change composite energy storage materials (PTCPCESMs) are widely used in various industries because of their high thermal conductivity, high photo-thermal conversion efficiency, high latent heat storage capacity, stable physicochemical properties, and energy saving effect.PTCPCESMs are a novel type material ...

Moreover, the HEO/TPU fiber has an elongation at break of 354.8% when the phase change enthalpy is as high as 177.8 J/g and the phase change enthalpy is still 174.5 J/g after fifty cycles.

High-performance composite phase change materials (PCMs), as advanced energy storage materials, have been significantly developed in recent years owing to the progress in ...