Composite fiber phase change energy storage pipeline

What is a phase change fibre?

Based on PCMs, phase change fibres (PCFs) have been developed to achieve constant temperatures inside clothing and reduce the discomfort caused by changes of the external environment temperature through the reversible storage and release of thermal energy , , .

What is a PCM combined energy storage pipe?

According to the concept of phase change energy storage,a PCM combined energy storage pipe was proposed in this paper. Not only does the pipe have good heat preservation performance,but it can also make use of the PCM's phase change energy release property,so that the oil can be transported safely .

Are phase change fibers reusable?

Moreover,the fibers showed quite high heat density of 122.5 J/g,much higher than that of the previously reported phase change fibers with a solid-solid phase-transition,and high reusability,with heat density of 102.0 J/g preserved after 100 heating-cooling cycles.

Are S-S phase change fibers a good tensile structure?

Conclusions S-S phase change fibers with enhanced heat energy storage density have been successfully fabricated from coaxial wet spinning and subsequent polymerization-crosslinking. The resulting fibers showed core-sheath structures,high flexibility and good tensile properties,with an elongation of 629.1 % and stress at break of 3.8 MPa.

Are solid-solid phase change fibers good for thermal management and latent heat storage?

Solid-solid phase change fibers are advantageousfor thermal management and latent heat storage,because they don't have the issue of liquid leakage facing those common ones that have a solid-liquid phase-transition. However,the relatively low heat density hinders such fibers from real applications.

What are S-S phase change fibers used for?

These attractive features make the fibers to have high potentials for wearable temperature management,energy harvesting and heat storage applications. Upon decreasing their diameters,the S-S phase change fibers could be woven (with other fibers) to further demonstrate their wearable applications.

Review on thermal energy storage with phase change materials and applications. Renew Sustain Energy Rev, 13 (2) (2009), pp. 318-345. ... Preparation of electrospun LA-PA/PET/Ag form-stable phase change composite fibers with improved thermal energy storage and retrieval rates via electrospinning and followed by UV irradiation photoreduction method.

HFF/PEG composite phase change thermo-regulating fibers (P-HFF) were prepared by the hollow fiber loading method to improve the passive thermal insulation ...

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Herein, novel composite phase change materials (CPCMs) with anisotropic heat conduction are manufactured by mixing continuous carbon fibers (CFs) and palmitic acid ...

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 utilization ...

Herein, we designed and fabricated multi-stimuli responsive hydrophobic conductive phase change fibers (HCPF) for electro-/photo-thermal energy harvesting and storage. The phase change fiber (PCF) was prepared by a facile and novel wet spinning method using a carbon nanotube/polyurethane/lauric acid (CNT/PU/LA) solution dope at the first time.

The phase change fibers containing PCMs could provide the surroundings relatively constant temperature through absorbing and releasing heat during phase transition process, which is widely used for thermal energy storage [19], electrical/solar energy harvesting [20] and smart thermoregulatory textiles [21]. Nevertheless, flexibility ...

Form-stable phase change composites with multistage pores based on black phosphorus nanosheets/PVA aerogel for efficient solar photothermal conversion ... A modified kapok fiber based phase change composite for highly-efficient solar-thermal conversion. Nano Energy ... Phase change thermal energy storage enabled by an in situ formed porous TiO ...

Based on stearic acid as phase change energy storage material, ... the composite PCMs with different CF content were placed in test tubes with the same pipe diameter. They were melted in a constant temperature water bath at 90°C and then taken out. ... in which (a), (c), (e), (g) were 2.5%, 5%, 7.5%, 10% stearic acid/carbon fiber composite ...

In this work, we fabricate polymer fibers that possess high loadings (up to 80 wt %) of microencapsulated PCMs (mPCMs) to provide sufficient heat storage capacity. We focus on the solution spinning of cellulose ...

As an eco-friendly polymer, polyethylene glycols (PEGs) have shown great potential as solid-liquid PCMs with particular features of high latent heat, small temperature variation during phase change, wide selectivity of molecular weight, non-toxicity and chemical stability [8, 9].Thus, PEGs have been studied as energy conservation and thermo-regulated materials over the ...

Carbon fiber composite phase change material (PCM) can serve as an excellent material for thermal storage system. This work presents a new composite PCM prepared with two raw materials of KAl(SO 4) 2 ·12H 2 O (X) and Na 2 SO 4 ·10H 2 O (Y), supporting materials activated carbon fibers (ACFs),

and thermal conductivity agent nano carbon powder (C). The ...

Phase change materials (PCM) with enhanced thermal conductivity and electromagnetic interference (EMI) shielding properties are vital for applications in electronic ...

Phase change composite fibers with wide phase-transition temperatures can be fabricated by co-electrospinning of different fatty acid eutectics. Many studies have been devoted to produce and characterize thermal performance of electrospun nano PCM composite fibers using fatty acid eutectics. ... Review on thermal energy storage with phase ...

Flexible, stimuli-responsive and self-cleaning phase change fiber for thermal energy storage and smart textiles Zixuan Niu, Shengyang Qi, Suhaib Shuaib Adam Shuaib, Weizhong Yuan Article 109431

Herein, we report a strategy to fabricate solid-solid phase change fibers with much enhanced energy storage density, through coaxial wet spinning using thermoplastic ...

Phase change materials (PCM) for thermal energy storage have attracted the attention of scholars and industry since the 1950"s due to their ability to absorb and release energy via latent heat as they undergo a phase transformation [1].The energy crisis in the 70"s and interest in using building construction materials to reduce the energy consumption in the ...

Solid-liquid phase change energy storage has drawn considerable attention from researchers both domestically and internationally due to its many benefits, which include a high density of energy storage, minimal thermal shift during the energy storage process, and an easy-to-manage process (Fig. 4) [[22], [23], [24]].

Besides, the heat conduction inside the woven metal fiber-phase change material composite contributes to at least 71.8% of total energy storage amount during conjugate heat transfer, demonstrating its dominant behavior rather than natural convection.

With the increasingly serious climate change and energy shortages, renewable energy harvesting, storage, conversion, regulation, and utilization have attracted tremendous attention [1, 2].Thermal energy storage (TES) is one of the key techniques to improve the thermal energy utilization efficiency by significantly reducing the energy loss between supply and ...

At this time, the textiles that utilize new technologies for phase change energy storage have the advantages of large energy storage capacity, small temperature fluctuation, and stable performance [[7], [8]], making phase change energy storage materials ideal candidates for regulating ambient temperature.PCMs are the key factor of PCMs energy storage textiles, ...

The phase change materials can store (or discharge) a lot of thermal energy to realize thermal energy storage,

which is of great help in solving the inconsistency between energy demand and supply. According to their operating temperature range, PCMs can be divided into high, medium and low temperature classes [7], [8] .

technology. According to the concept of phase change energy storage, a PCM combined energy storage pipe was proposed in this paper.Not only does the pipe have good heat preservation performance, but it can also make use of the PCM"s phase change energy release property, so that the oil can be transported

Solar thermal energy conversion and storage technology is essential for the effective utilization of abundant solar energy for industrial heating, hot water supply, and other heating-related applications [[1], [2], [3]].However, the intermittent and erratic nature of solar irradiation seriously limits the extensive harnessing of solar energy .

However, when applied to thermal energy storage applications, supercooling and phase separation are problematic. To effectively circumvent this issue, this work considers utilizing the disodium hydrogen phosphate dodecahydrate as the matrix of the composite phase change material, as the phase transition temperature is suitable for the battery"s ...

Although the large latent heat of pure PCMs enables the storage of thermal energy, the cooling capacity and storage efficiency are limited by the relatively low thermal conductivity (~1 W/(m ? K)) when compared to metals (~100 W/(m ? K)). 8, 9 To achieve both high energy density and cooling capacity, PCMs having both high latent heat and high thermal ...

heat transfer characteristics and phase change characteris-tics of heat storage phase change materials in energy storage devices. Meanwhile, a 2D mathematical model of CDT was established by CFD software to simulate the phase trans-formation of paraffin wax [26]. Ghalambaz M [27] used the finite element method to study the influence of ambient tem-

Composite pipelines incorporating phase change materials (PCMs) enhance thermal performance through latent heat storage, prolonging safe shutdown periods during ...

In response to the need for personal thermal management in the sudden temperature changes in cold environments, a scalable sheath-core phase change composite fiber (PCF) has been successfully fabricated on a large ...

PHASE CHANGE MATERIAL Phase Change Materials can be abbreviated as PCM [8]. In a certain temperature range, phase change energy storage material makes use of itself phase state or structural changes, to automatically absorb or release latent heat from or to the environment so as to achieve the control of the environment temperature.

Carbon nanotube graphene multilevel network based phase change fibers and their energy storage properties+.

Composite fiber phase change energy storage pipeline

Xiaoyu Yang ab, Jingna Zhao * b, Tanqian Liao c, Wenya Li c, Yongyi Zhang b, Chengyong Xu a, Xiaohua ...

An innovative electrospun form-stable phase change composite material is fabricated by combining binary fatty acid eutectics of capric-lauric acid (CA-LA) and capric-palmitic acid (CA-PA) as the phase change materials (PCMs) and polyethylene terephthalate (PET) as the supporting matrix. The encapsulated PCM composite fibers are produced by co ...

A modified kapok fiber based phase change composite for highly-efficient solar-thermal conversion. Nano Energy, 108 (2023) Google Scholar. ... Flexible, stimuli-responsive and self-cleaning phase change fiber for thermal energy storage and smart textiles. Composites Part B: Engineering (2022), p. 228. View PDF View article View in Scopus Google ...

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