Application of luminescent energy storage phase change fiber

What are phase change fibers?
Over the last 30years,phase change fibers (PCFs) have been extensively investigated and applied as high-performance nonwoven fabrics and coatings. As a prospective renewable and clean material,PCFs with micro-scale have been successfully prepared by melt/wet spinning for applications in thermal energy storage (TES) and temperature regulation.

What are phase change fibers containing PCMS used for?
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,electrical/solar energy harvesting and smart thermoregulatory textiles .

What is a core-sheath phase change fiber (PCF)?
Core-sheath phase change fibers (PCFs) were prepared with polyurethane (PU) as the sheath material and octadecane (OD) as the core materials by coaxial wet spinning. Titanium carbide (Ti 3 C 2), as excellent solar absorber, was added into the sheath layer to achieve efficient photo-to-thermal conversion.

Can micro-scale PCFs be used for thermal energy storage and temperature regulation?
As a prospective renewable and clean material, PCFs with micro-scale have been successfully prepared by melt/wet spinning for applications in thermal energy storage (TES) and temperature regulation. With the development of fiber manufacturing techniques, e.g. electrospinning, ultrafine PCFs have been exploited and investigated in the last decade.

Can pyrene-based aggregation-induced emission luminogen (aiegen) be used as phase change material?
In this study, novel phase change material (PCM) composite fiber films, composed of Py-CH (one novel pyrene-based aggregation-induced emission luminogen (AIEgen))/polyvinyl pyrrolidone (PVP)/polyethylene glycol (PEG), have been produced by electrospinning technology with PEG as the phase change material.

Which fiber has the largest phase change enthalpy?
Sheath-core PU@ODphase change fibers were prepared by coaxial wet spinning,different extruded rate of core layer OD and sheath layer PU was investigated to achieve the largest phase change enthalpy (185.00 J/g).

In this research, dual-functional ultrafine composite fibers with phase-change energy storage and lumines-cence properties were successfully prepared using a parallel electrospinning technique ...

Phase change materials (PCMs) have been extensively explored for latent heat thermal energy storage in advanced energy-efficient systems. Flexible PCMs are an emerging class of materials that can withstand certain deformation and are capable of making compact contact with objects, thus offering substantial potential in a wide range of smart applications.

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Preparation of electrospun LA-PA/PET/Ag form-stable phase change composite fibers with improved thermal energy storage and retrieval rates via electrospinning and ...

4.4 Fundamental information about luminescence and solar cell materials 4.4.1 Luminescent materials. Luminescence--"Luminescenz"--was first reported by German physicist Wiedemann in 1888. Luminescent materials are the semiconductors materials or inorganic/organic compounds consisting of a host lattice and do-pant element called as activators (traditionally, transition or ...

Cellulose-based phase change fibres for thermal energy storage and management applications. Author links open overlay panel Yongqiang Qian a b c, Na Han b c, Xuefeng Gao b c, Xiyin Gao d, Wei Li b c ... Review on electrospun ultrafine phase change fibers (PCFs) for thermal energy storage. Appl. Energy, 210 (2018), pp. 167-181. View PDF View ...

Recently, many researchers have considerable interest in the field of luminescent materials. Chen et al. [22] introduced carbon quantum dots (CQDs) into metal-organic frameworks (MOFs) for fluorescence-functionalized phase change materials, in which MOFs serves as supporting hosts, CQDs as fluorescent guests and stearic acid as phase change materials.

Nowadays, the growing concern about improving thermal comfort in different structures (textiles, buildings, and pavements, among others) has stimulated research into phase change materials (PCMs). The direct ...

Ultrafine composite fibers consisting of a thermoplastic polyurethane solid-solid phase-change material and organic lanthanide luminescent materials were prepared through a ...

Luminescent phase change fibers were prepared by electrospinning polyvinyl pyrrolidone (PVP)/Eu-PEG. ... low-temperature thermal energy storage applications to regulate temperature and satisfy the ...

As an emerging fiber material, luminescent fibers have been used in the military, firefighting, marine transportation, fishing, and other fields; mainly covering the application of each ...

Phase change fibers (PCFs), incorporating with diverse phase change materials (PCMs) such as paraffin wax (PW), have been recognized as one of the effective strategies for fabricate smart thermoregulatory textiles. ... Review on thermal performances and applications of thermal energy storage systems with inorganic phase change materials. Energy ...

Differential scanning calorimetry (DSC) and Luminescence measurements indicated that the unique structure of the parallel electrospun ultrafine fibers provides the products with good thermal energy storage and luminescence properties. Ultrafine composite fibers consisting of a thermoplastic polyurethane solid-solid phase-change material and organic lanthanide ...

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Phase change fibers (PCFs) can effectively store and release heat, improve energy efficiency, and provide a basis for a wide range of energy applications. Improving energy storage density and preserving flexibility are the primary issues in the efficient manufacture and application development of PCFs. Herein, we have successfully fabricated a suite of flexible ...

Further, for other aspects of functional modification, the phase transition process is often invisible due to the use of supporting matrix. When reversible thermochromism is combined with PCM, the color change is synchronized with the changes of temperatures, making the phase change process more intuitive and further broadening its practical application in the ...

The invention further discloses a preparation method of the nano phase change and energy storage luminescent fibers. The polyurethane solid-solid phase change material is used as a fiber forming polymer and the benzoic acid ternary rare earth luminescent material is used as the luminescent material; ethyl acetate and N,N-dimethylformamide are ...

The development of fibers is a testament to human innovation and has been integral to the advancement of civilization since ancient times. The 19th century marked a significant milestone with an unprecedented technological revolution in chemical fibers, which promoted the progress of the fiber industries [1, 2].Among the many innovations, smart fibers ...

Ultrafine composite fibers consisting of a thermoplastic polyurethane solid-solid phase-change material and organic lanthanide luminescent materials were prepared through a parallel electrospinning technique as an innovative type of ultrafine, dual-functional ...

Compared to other storage technologies such as sensible heat storage and chemical reaction storage, phase change storage has the benefits of high energy density, small equipment size, simple materials, and a constant temperature during the phase change process, as well as a wide range of applications [6,7].

Herein, we have successfully fabricated a suite of flexible PCFs with high energy storage density, which use hollow carbon fibers (HCFs) encapsulated phase change materials ...

Heat storage technology can not only solve and alleviate the energy conversion and supply-demand mismatch in time, space, intensity and location but also facilitate the efficient use of energy. Phase change materials (PCMs) have been investigated for energy storage applications, it has high thermal storage densities and nearly isothermal ...

Since its invention, luminous fibers have received extensive attention from scientific researchers. Luminous fibers are mainly distinguished by their energy source and are divided into two types active and passive luminous. As an emerging fiber material, luminescent fibers have been used in the military, firefighting,

marine transportation, fishing, and other fields; mainly ...

In this research, dual-functional ultrafine composite fibers with phase-change energy storage and luminescence properties were successfully prepared using a parallel ...

A technology of luminescent fiber and nanophase, which is applied in fiber treatment, fiber chemical characteristics, spinning solution preparation, etc., can solve the problems of decreased fluorescence intensity, difficulty in uniform dispersion, and low addition amount, so as to increase the phase transition rate and improve the color Effect of purity and fluorescence lifetime, ...

In this study, Eu-PEG phase-change luminescent materials were synthesized by coordinating rare earth Eu 3+ ions with the carboxylate groups of a PEG modified by two terephthalic acid groups. The polyvinylpyrrolidone (PVP)/Eu-PEG composite fibers were then prepared by electrospinning to form PCMs for thermal energy storage.

The greatest approach to link supply and demand for energy is through the utilization of thermal energy storage facilities [5]. These facilities not only boost efficiency but also reduce the dependency on fossil resources. Thermal energy storage has one of the highest storage efficiencies out of other energy storage systems employed nowadays.

Due to the continuous development of intelligent technology, the demand for phase change materials continues to increase and the single thermal storage function falls short in serving advanced applications [11] nsequently, more and more researchers have begun to study smart phase change materials that can adapt to a variety of application scenarios [[12], ...

5. Duan M. Electro-thermochromic luminescent fibers controlled by self-crystallinity phase change for advanced smart textiles. ACS Applied Materials & Interfaces,2021,13(48):57943-57951 CSCD 1 6. .

The ever-increasing energy shortages and global warming is one of the widely discussed hot issues due to the ceaselessly increase in the depletion of fossil fuels and greenhouse gas emissions [1, 2].To resolve the inherent trade-off between energy supply and demand, improving energy utilization efficiency has been acted as one of the most effective ...

Persistent luminescent fiber with photochromic properties is highly desirable because of its promising applications in smart textiles. However, to our knowledge, preparing the red persistent luminescent fiber with photochromic performance via a facile method has not been investigated. Herein, we report a facile one-step wet spinning method to fabricate red ...

The combination of phase change and fluorescence emission properties in the crosslinking network structure will endow FPCMs with potential application abilities in smart energy-storage fluorescent ...

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In this study, novel phase change material (PCM) composite fiber films, composed of Py-CH (one novel pyrene-based aggregation-induced emission luminogen ...

The development of thermosensitive luminescent fiber (TLF) is of great significance for flexible wearable devices. Herein, reversible color changing luminescent fibers were successfully fabricated via wet-spinning of mixing Sr 2 ZnSi 2 O 7: Eu 2+, Dy 3+ (SZSO), Y 2 O 2 S: Eu 3+, Mg 2+, Ti 4+ (YOS) and blue thermochromic dye (BTD). The UV-vis absorption and ...

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