Phase change energy storage film

What is a flexible phase change material based on PA/tpee/EG?
A shape-memory, room-temperature flexible phase change material based on PA/TPEE/EG for battery thermal management. Chem. Eng. J.463, 142514 (2023). Qi, X., Shao, Y., Wu, H., Yang, J. & Wang, Y. Flexible phase change composite materials with simultaneous light energy storage and light-actuated shape memory capability. Compos. Sci.

Can phase change materials be used for zero-energy thermal management?
Nature Communications 14,Article number: 8060 (2023) Cite this article Phase change materials (PCMs) offer great potentialfor realizing zero-energy thermal management due to superior thermal storage and stable phase-change temperatures.

Are phase-change nanofiber films suitable for solar-to-thermal energy conversion and storage?
In this study,phase-change nanofiber films [PCNFs,sodium lignosulfonate (SLS)/polyvinyl alcohol (PVA)/polyethylene glycol (PEG)],which maintain their shape,were developed for solar-to-thermal energy conversion and storage.

Are phase change materials suitable for wearable thermal regulation?
Phase change materials (PCMs) offer great potential for realizing zero-energy thermal management due to superior thermal storage and stable phase-change temperatures. However,liquid leakage and solid rigidity of PCMs are long-standing challengesfor PCM-based wearable thermal regulation.

Are polyethylene glycol/polyurethane acrylate-based flexible phase-change films cured using UV curing technology?
In this study, we prepared novel polyethylene glycol (PEG)/polyurethane acrylate (PUA)-based flexible phase-change films (PCFs) using ultraviolet (UV) curing technology to solve these problems.

Can thermal energy storage technology be used in practical engineering?
The application of thermal energy storage (TES) technology in practical engineering has been limitedby liquid leakage and material rigidity during phase change.

Phase change materials (PCMs) are ideal candidates for PTM technologies due to their high energy storage density and isothermal phase transition process [18], [19], [20].PCM-based PTM materials can effectively regulate the surface temperature of the human body through latent heat storage/release process, creating an excellent thermal sensation [21], [22], [23].

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

Preparation of the polyvinyl alcohol thermal energy storage film containing the waste fly ash based on the phase change material. Polym. Eng. Sci., 62 ... Flexible graphene aerogel-based phase change film for solar-thermal energy conversion and storage in personal thermal management applications. Chem. Eng. J., 419 (2021), Article 129637.

Phase change materials (PCMs) have been widely used in various fields of thermal energy storage because of their large latent heat value and excellent temperature control performance. Based on the microstructure packaging strategy, PCMs are developed into shape-stabilized PCMs, which can solve the problem of leakage when phase change occurs.

The phase change composite films PEG@TPU/BNNS-es were prepared by mold-pressing the porous fabric at room temperature under 15 MPa for 30 min and then at ~ 60 °C under 10 MPa for 30 min. ... W. Wu, S. Wang, Form-stable and thermally induced flexible composite phase change material for thermal energy storage and thermal management ...

The PVA/FAS thermal energy storage films with the 15% HFAS content have the best tensile strength (9.87 MPa), thermal conductivity (0.611 W · m -1 ·K -1), and thermal energy storage property (59.04 J·g -1 after 1 cycle time) because of the best compatibility between HFAS and PVA. After 500 cycle times, the latent heat of the PVA/HFAS ...

The 0.2PPL-2 film exhibits solid-solid phase change behavior with energy storage density of 131.8 J/g at the transition temperature of 42.1 °C, thermal cycling stability (500 cycles), wide-temperature range flexibility (0-60 °C) and self-healing property. Notably, the PPL film can be recycled up to 98.5% by intrinsic remodeling. Moreover ...

The phase change film exhibited high energy storage efficiency as 91.3%. Abstract. Carbon nanotubes (CNTs) based phase change composites have been widely reported to be used in areas related to energy conversion and storage. ... Owing to the highly conductive SWCNT skeleton, electro-to-heat storage of our flexible phase change films could be ...

The study presents a multi-field driven thermochromic films with phase change energy storage properties (PCES-TCF). PCES-TCF is constructed by thermochromic liquid crystal layer and polymer dispersed liquid crystal layer. In the performance experiments, the effects of diluent, liquid crystal and PCESM contents on the electro-optical properties ...

During the heating process, the temperature of phase change film increased rapidly, and a temperature plateau with a minimum slope was observed at a temperature of ... Optimization strategies of composite phase change materials for thermal energy storage, transfer, conversion and utilization. Energy Environ. Sci., 13 (12) (2020), pp. 4498-4535 ...

The CNF/PEO composite films are therefore promising solid-solid phase-change materials for energy storage

with high film dimensional stability. Graphical abstract. Download: Download high-res image ... their structures were investigated as a function of the T-CNF content for application as high-performance solid-solid phase-change films. 2.

Phase change materials (PCMs) are pivotal in thermal energy management and conversion applications owing to their exceptional thermal energy storage and release characteristics. However, persistent challenges such as poor thermal conductivity and leakage issues have impeded their widespread adoption.

Developing phase change materials (PCMs) with solar-thermal energy conversion and storage for wearable personal thermal management is of significance but challenging, due to the difficulty of overcoming the liquid phase leakage, weak light adsorption, and solid phase rigidity of conventional phase change materials.

The rapidly increasing demand for wearable thermal management systems, which can directly provide a comfortable temperature environment for the human body, has accelerated the development of flexible multifunctional phase-change materials (PCMs) [1], [2].PCMs are considered promising thermal storage materials that can repeatedly store and ...

Thermal energy storage can be categorized into different forms, including sensible heat energy storage, latent heat energy storage, thermochemical energy storage, and combinations thereof [[5], [6], [7]].Among them, latent heat storage utilizing phase change materials (PCMs) offers advantages such as high energy storage density, a wide range of ...

Nanofibrous kevlar aerogel films and their phase-change composites for highly efficient infrared stealth. ACS Nano, 13 (2019), pp. 2236-2245. ... Recent advances on thermal conductivity enhancement of phase change materials for energy storage system: a review. Int. J. Heat Mass Transfer, 127 (2018), pp. 838-856. View PDF View article View in ...

The 0.2PPL-2 film exhibits solid-solid phase change behavior with energy storage density of 131.8 J/g at the transition temperature of 42.1 °C, thermal cycling stability ...

Thermal storage is very relevant for technologies that make thermal use of solar energy, as well as energy savings in buildings. Phase change materials (PCMs) are positioned as an attractive alternative to storing thermal energy. This review provides an extensive and comprehensive overview of recent investigations on integrating PCMs in the following low ...

The convection effect in the liq. film can be neglected approx. for the range of the Stefan no. <0.1. It is found that the solid descending velocity depends linearly on the liq.-to-solid d. ratio, and that the ratios of solid descending velocity, film thickness and friction coeff. to the conduction soln. are proportional to 3/4, 1/4 and -1/4 ...

Phase change materials (PCMs) are such a series of materials that exhibit excellent energy storage capacity

and are able to store/release large amounts of latent heat at ...

The thermochromic phase change films exhibited favorable attributes, including flexibility and reversible thermochromic ability, and has phase-change enthalpy of 90.6-136.0 J·g -1 and light-to-thermal energy conversion up to 89.8 %. Furthermore, a wearable thermal management device (TC-PCMs/10BN/OBC-CC) was successfully constructed by ...

The phase-change materials with great latent heat and energy density have been widely used for heat storage and thermal regulation [[11], [12], [13]].The organic phase-change materials have garnered a lot of attention due to their good chemical stability, low supercooling, and weak chemical corrosiveness [14, 15].Selecting appropriate organic phase-change ...

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 constructed ...

Phase change materials (PCMs) having a large latent heat during solid-liquid phase transition are promising for thermal energy storage applications. However, the relatively low thermal conductivity of the majority of promising PCMs (<10 W/(m ? K)) limits the power density and overall storage efficiency.

Phase change material (PCM)-based thermal energy storage significantly affects emerging applications, with recent advancements in enhancing heat capacity and cooling power. This perspective by Yang et al. discusses PCM thermal energy storage progress, outlines research challenges and new opportunities, and proposes a roadmap for the research community from ...

6 · In addition, the phase change film showed latent heat capacity as high as 96.18 J/g. After 20 heating/cooling cycles, the composite PCMs remains the same phase change ...

A good way to store thermal energy is by using a phase-change material (PCM) such as wax. Heat up a solid piece of wax, and it"ll gradually get warmer -- until it begins to melt. As it transitions from the solid to the liquid phase, it will continue to absorb heat, but its temperature will remain essentially constant.

A highly thermally conductive solid-liquid phase change film can be a potential candidate for the next-generation heat dissipation material by coupling the efficient heat storage and self ...

As one of the important directions of solar energy utilization, the construction of composite photothermal phase change materials (PCM) with reasonable network support and low leakage in the simple method is important to solve the transient availability of solar energy and achieve long-lasting energy output.

Phase change materials (PCMs) are such a series of materials that exhibit excellent energy storage capacity

and are able to store/release large amounts of latent heat at near-constant temperatures ...

As latent heat storage materials, phase change materials (PCMs) have attracted widespread attention in thermal management systems by virtue of their ability to absorb or release significant amounts of latent heat at nearly constant transition temperatures [9], [10], [11], [12].Among these materials, organic PCMs with suitable phase transition temperatures are the ...