Wood phase change energy storage

Can phase change materials be used for thermal energy storage?
" Use of phase change materials in wood and wood-based composites for thermal energy storage: A Review ," BioResources 18 (4), 8781-8805. Using phase change materials (PCMs) is an efficient solution for reducing energy consumption in buildings.

Does a wood-based phase change composite conserve energy?
In addition, the energy storage capability and thermal reliability of the prepared wood-based phase change composite are investigated by DSC and TG measurements, and its electro-thermal conversion and heat preservation are also explored by an infrared thermal camera.

Are wood-based phase change materials reversible thermochromic?
To broaden the application scope of wood-based phase change materials (PCMs) and increase their functional diversity, this research seeks to create a wood-based energy storage composite material that incorporates both phase-change capabilities and reversible thermochromic properties (TPW).

Can a composite phase change material improve energy management after impregnation?
A novel composite phase change material was fabricated by using the mixture of epoxy resin (EP) and polyethylene glycol (PEG) as phase change materials,delignified wood as supporting material by Xia et al. and they indicated that this composite had great energy management abilityand thermal reliability after impregnation.

Can phase change materials be used in wood?
Phase change materials have been successfully incorporated into various construction materials such as concrete, brick, or plaster. The primary objective of this review is to examine previous studies conducted on the application of PCMs in wood.

Can phase change materials reduce energy consumption in buildings?
Using phase change materials (PCMs) is an efficient solutionfor reducing energy consumption in buildings. These materials have a large capacity for storing thermal energy,making them an appealing option for energy management purposes.

PCMs can be applied to the storage of latent thermal energy [[6], [7], [8]] will undergo phase transformation through the change of crystal structure with the change of external temperature, and at the same time, PCMs are capable of storing or releasing considerable latent heat [9, 10].There are many different types of PCMs divided into several types (e.g., solid ...

A novel thermal energy storage (TES) composites system consisting of the microPCMs based on n-octadecane nucleus and SiO 2 /honeycomb-structure BN layer-by-layer shell as energy storage materials, and wood powder/Poly (butyleneadipate-co-terephthalate) (PBAT) as the matrix, was created with the goal of improving

the heat transmission and ...

In addition, its phase change temperatures, enthalpies and chemical structure remain unchanged after 100 thermal cycles, demonstrating outstanding cycling reliability. In conclusion, we developed a metallic wood-based phase change material (MWM) with excellent energy storage and thermal conductivity through an eco-friendly and simple method.

The development of form-stable phase change materials (PCMs) with flame retardancy and the visual thermal storage process is crucial for their application in building energy conservation. Herein, an active ...

This work focused on a novel shape-stable phase change composites (SSPCMs) for thermal energy storage. Polyethylene glycol (PEG)/wood flour (WF) composites were selected as latent heat storage medium, and polylactic acid (PLA) was selected as the matrix.

Nevertheless, conventional flame retardant techniques, including surface coating and the incorporation of flame retardants, would decrease thermal energy storage density of wood-based phase change materials with the increase of flame retardant additive (Chu et al., 2022, Wang et al., 2024, Yu et al., 2024).

Thermal energy storage is critical in the energy application due to fossil fuels shortage and intermittent of renewable energy such as solar, wind and tidal energy [1, 2].Phase change materials (PCMs) in thermal energy storage are particularly prominent, which can store latent heat during melting and release latent heat during solidifying [3, 4] recent years, ...

Six novel polymer-based form-stable composite phase change materials (PCMs), which comprise micro-encapsulated paraffin (MEP) as latent heat storage medium and high-density polyethylene (HDPE)/wood flour compound as supporting material, were prepared by blending and compression molding method for potential latent heat thermal energy storage ...

Efficient energy storage devices and systems are essential for protecting the environment due to the continuous increase in greenhouse gas emissions and the depletion of fossil fuels [1], [2], [3], [4] order to address the energy crisis, the increasing consideration of thermal energy storage (TES) has been paid to phase change materials (PCMs) because they ...

Phase change energy storage is subsequently achieved by in situ polymerization of polyethylene glycol and hexamethylene diisocyanate to form polyurethane in the cell lumen.

Thermal energy storage technology based on phase change materials (PCMs) is an advanced technology. Thermal energy storage is triggered by the phase state (usually solid or liquid) transition caused by the intermolecular force change of condensed matter [5].Accompanying with the advantages of simple and compact structure, reliable performance ...

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With the increasing importance of electronic devices in modern industry, considerable efforts have been devoted to solving the problem that the electronic devices fail to work normally in a cold environment. Herein, we designed and fabricated a graphene wrapped wood-based phase change composite with electro-thermal conversion and energy storage ...

In this work, we prepared a composite phase change material by using wood as the matrix and polyethylene glycol (PEG) as phase change material (PCM). The composite ...

Addressing the challenges of energy storage liquid leakage and long-term stability in energy storage is crucial for achieving sustainable energy efficiency. In this study, polymethyl ...

It is because these impact that high-energy storage density, appropriate phase change temperature, and high phase change latent heat, PCMs have been widely used in the buildings industry (concrete [7], gypsum [8], cement [9]). In fact, the study of incorporating PCMs into building materials to store and release the solar energy to maintain ...

Processing solid wood into a composite phase change material for thermal energy storage by introducing silica-stabilized polyethylene glycol

In recent years, multifunctional form-stable composite phase change materials have been the research focus in the field of thermal energy storage. In this work, magnetic wood-based composite phase change materials are prepared via the impregnation of a compound of 1-tetradecanol and Fe 3 O 4 nanoparticles into delignified balsa wood ...

Form-stable composite phase change materials, as thermal energy storage technology, show great promise for reducing energy consumption and relieving current energy shortage problems. However, porous supporting material s and most phase change materials are hydrophilic and hygroscopic, which cause crack-formation at the interfaces between ...

Herein, novel form-stabilized composite PCMs (CMPCMs) with high energy storage density, excellent flame retardancy, and desirable photothermal conversion efficiency were prepared by impregnating n ...

Flame-Retardant and Form-Stable Delignified Wood-Based Phase Change Composites with Superior Energy Storage Density and Reversible Thermochromic Properties for Visual Thermoregulation. Jiuao Wang

Interests: Multi-Functional Wood-Based Phase Change Materials for Thermal Energy Storage. Introduced phase change materials (e.g. paraffin, polyethylene glycol, 1-tetradecanol) to the wood by vacuum impregnation method, to solve the liquid leakage problem of phase change materials, due to the surface tension and capillary action of wood.

Latent heat storage using phase change material (PCM) have been proved to be the most effective approaches

among the thermal energy storage (TES) system due to the high energy storage density, environmental friendliness, and recyclability [[9], [10], [11]].PCMs can be mainly classified into three categories based on their material composition: inorganic salt ...

Herein, we develop an optically controlled phase change wood (OCPCW) through impregnating methoxyazobenzene (mAZO) into delignified basswood with light energy storage ...

Phase change materials (PCMs) offer a promising solution to address the challenges posed by intermittency and fluctuations in solar thermal utilization. However, for organic solid-liquid PCMs, issues such as leakage, low thermal conductivity, lack of efficient solar-thermal media, and flammability have constrained their broad applications. Herein, we ...

Herein, we designed and fabricated a graphene wrapped wood-based phase change composite with electro-thermal conversion and energy storage capabilities by ...

Thermal energy storage is important for energy saving and social developing. Low-cost, high thermal conductivity, form-stable composite phase change materials are urgent in energy storage and management. In this work, a novel carbonized wood-based composite phase change materials (TDCW) are fabricated by impregnating of 1-tetradecanol (TD) into ...

The rapid development of economy and society has involved unprecedented energy consumption, which has generated serious energy crisis and environmental pollution caused by energy exploitation [1, 2] order to overcome these problems, thermal energy storage system, phase change materials (PCM) in particular, has been widely explored [3, 4].Phase ...

Flexible, stimuli-responsive and self-cleaning phase change fiber for thermal energy storage and smart textiles. Compos B Eng, 228 (2022), pp. 109431-109441. ... Fluorescent thermochromic wood-based composite phase change materials based on aggregation-induced emission carbon dots for visual solar-thermal energy conversion and storage.

Although organic phase-change materials (PCMs) have been widely used for thermal energy storage, their high flammability, poor photothermal conversion efficiency, and liquid leakage issues severely restrict their practical ...

In comparison with sensible heat, latent heat storage based on phase change materials (PCMs) has received considerable attention on account of its high-energy storage density, ... The mechanism of solar thermal energy storage about the obtained PEG/wood flour SSPCMs are described below. When the SSPCMs is irradiated by sunlight, the temperature ...

Wood-based composite phase change materials (PCMs) have considerable development potential in shape-stable thermal energy storage. However, Wood-based composite PCMs possess inflammability due to

wood-based supporting materials and organic PCM, which limits its practical application.

The combination of wood and phase change energy storage materials (PCMs) can improve the phase change latent heat and temperature adjustment time of wood [[7], [8], [9]]. According to the form of heat storage, PCMs can usually be divided into solid-solid, solid-liquid, liquid-gas and solid-gas type, etc. [10,11]. Solid-liquid PCMs have the ...

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