



## phase change energy storage microspheres

To address this challenge, integrating energy storage media is essential. Phase change materials (PCMs) have the advantages of high energy storage density, low temperature change, and low thermal expansion coefficient, and are considered an ideal thermal energy storage medium. The ideal solution for this problem is anticipated to be the combination of phase change materials (PCMs) with heat storage capabilities and graphene oxide (GO) with high thermal conductivity to give a composite structure with a specific morphology for the function of temperature regulation. In this article, the hollow glass microsphere (HGS)/polyethylene glycol (PEG) composites were prepared as form-stable phase change materials (FSPCMs) for thermal energy storage (TES) via direct impregnation method. In the prepared composites, the PEG functioned as phase change substance and the HGS. In this paper, we prepared magneli-phase  $Ti_nO_{2n-1}$  ( $Ti_4O_7$ ) mesoporous hollow microspheres as photothermal materials by employing titanium dioxide and polydopamine as raw materials and using the high-temperature carbothermal reduction method. The  $Ti_4O_7$ /PCMs with photothermal conversion and energy. In this paper, we prepared magneli-phase  $Ti_nO_{2n-1}$  ( $Ti_4O_7$ ) mesoporous hollow microspheres as photothermal materials by employing titanium dioxide and polydopamine as raw materials and using the high-temperature carbothermal reduction method. The  $Ti_4O_7$ /PCMs with photothermal conversion and energy. The multi-layer hollow microspheres provide the micro-nano space structure for ODA, enhance the heat transfer rate of MSHS@ODA, effectively solve the leakage problem, and enable MSHS@ODA to have a Microsphere Structure Composite Phase Change. The composite microspheres exhibit no leakage (<math>\leq 0.5\%</math>) and superior phase transition behavior after heating-cooling cycles, and sense external environments such as temperature changes and water. PEG/GO phase-change composite aerogel. In this study, electrostatic spraying technology was effectively employed to fabricate GO/polyethylene glycol (PEG) phase-change aerogel microspheres (GPAMs), using GO as the supporting. Preparation of hierarchical porous microspheres composite phase. We reported an effective strategy for constructing hierarchical porous composite microspheres (PCN) through spray drying, calcination, and acid activation, using palygorskite. Preparation and thermal performance of novel form-stable phase. In this article, the hollow glass microsphere (HGS)/polyethylene glycol (PEG) composites were prepared as form-stable phase change materials (FSPCMs) for thermal. Superhydrophobic multi-shell hollow microsphere confined phase. The multi-layer hollow microspheres provide the micro-nano space structure for ODA, enhance the heat transfer rate of MSHS@ODA, effectively solve the leakage problem, and enable. Inorganic hollow microsphere based energy storage phase. The paper focuses on the preparation of  $Ti_4O_7$  mesoporous hollow microspheres and  $Ti_4O_7$ /PCMs composites. They have superhydrophobicity, acid and alkali resistance. Inorganic hollow microsphere based energy storage phase. In this paper, we prepared magneli-phase  $Ti_nO_{2n-1}$  ( $Ti_4O_7$ ) mesoporous hollow microspheres as photothermal materials by employing titanium dioxide and polydopamine as raw materials and. Phase Change Materials Meet Microfluidic. One way to achieve this is to use phase change materials (PCMs) as thermal energy storage media, which can be used to regulate



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temperature or provide heating/cooling in various applications organic hollow microsphere based energy storage phase change To address this challenge, integrating energy storage media is essential. Phase change materials (PCMs) have the advantages of high energy storage density, low Hierarchical porous kaolinite microspheres for leakage-resistant In this work, the as-prepared PKM and HPCK microspheres were employed as supporting materials to develop SA-based composite form-stable phase change materials (CFSPCMs) for Hierarchical porous kaolinite microspheres for leakage-resistant Hierarchical porous kaolinite microspheres for leakage-resistant and high-conductivity phase change composites in advanced thermal energy storage Applied Clay Science ( IF 5.8 ) Pub Metal-based phase change material (PCM) Abstract Thermal energy storage by solid-liquid phase change is one of the main energy storage methods, and metal-based phase change material (PCM) have attracted more Microencapsulation of Metal-based Phase Change Material for Latent heat storage using alloys as phase change materials (PCMs) is an attractive option for high-temperature thermal energy storage. Encapsulation of these PCMs is Shape-Stabilized Phase Change Materials Based Abstract The development of solar energy conversion and storage technologies has been attracting considerable attention in recent years. In this paper, a novel shape-stabilized phase change material High-strength geopolymer hollow microsphere, preparation Abstract A high-strength geopolymer hollow microsphere, a preparation method thereof and a phase change energy storage microsphere are provided, including: dissolving Sea urchin-like Fe<sub>3</sub>O<sub>4</sub> hollow microspheres/fatty amines composites phase Sea urchin-like Fe<sub>3</sub>O<sub>4</sub> hollow microspheres/fatty amines composites phase change materials for highly efficient light-to-thermal conversion and heat storage One-step preparation of macropore phase change materials Herein, a kind of macropore PCMs (MPCMs) was synthesized by directly adding expanded microspheres into polyethylene glycol-based PCMs, in which the microspheres can Graphene Aerogel Templated Fabrication of Phase Phase change materials, changing from solid to liquid and vice versa, are capable of storing and releasing a large amount of thermal energy during the phase change, and thus hold promise for numerous Encapsulation of phase change materials in conjugated Reduction of thermal loss and phase change material leakage: CMP hollow microspheres can encapsulate phase change materials within their cavities. This encapsulation US11685683B2 A high-strength geopolymer hollow microsphere, a preparation method thereof and a phase change energy storage microsphere are provided, including: dissolving sodium hydroxide, Superhydrophobic multi-shell hollow microsphere confined phase change The phase change enthalpy can reach 130.7 J·g<sup>-1</sup> and maintain a high energy storage density during 100 cyclic phase change tests. Specifically, MSHS@ODA decreases the operating INI coating on a surface of the microsphere , adding a powder dispersant and stirring to disperse the microsphere , after the epoxy resin is solidified , screening a superfluous powder dispersant to Encapsulation of phase change materials in conjugated Reduction of thermal loss and phase change material leakage: CMP hollow microspheres can encapsulate phase change materials within their cavities. This encapsulation INI coating on a surface of the microsphere , adding a powder dispersant and



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stirring to disperse the microsphere, after the epoxy resin is solidified, screening a superfluous powder dispersant to Microencapsulation of phase change materials for thermal energy storage Thermal energy can be stored either as sensible heat, thermochemical energy, or latent heat using a phase change material (PCM). PCMs are organic or inorganic compounds, Silver microsphere doping porous-carbon inspired shape-stable phase Latent heat energy storage is to store or release energy by absorbing or releasing heat in the process of phase change by using phase change materials (PCMs). Phase Change Materials Meet Microfluidic Improving the utilization of thermal energy is crucial in the world nowadays due to the high levels of energy consumption. One way to achieve this is to use phase change materials (PCMs) as thermal energy Photothermal Phase Change Energy Storage To meet the demands of the global energy transition, photothermal phase change energy storage materials have emerged as an innovative solution. These materials, utilizing various photothermal Innovative preparation of Al-Si alloy phase change microspheres Phase-change Materials (PCMs) have garnered significant attention in the field of energy storage. However, a major challenge remains the corrosiveness of liquid metals at Thermal properties of polyethylene glycol/carbon Phase change energy storage technology is one of the most effective ways to deal with the related energy shortage [1, 2]. Accordingly, one of the core goals of phase change energy storage technology is to Nanoflake-Constructed Supramolecular Hierarchical Porous Microspheres The leakage and fire hazard of organic solid-liquid phase change material (PCM) tremendously limit its long-term and safe application in thermal energy storage and regulation. In this work, MXene nanosheets coated conjugated microporous polymers Consequently, applying phase change energy storage to interfacial evaporation process for synthesizing composites with both waste heat utilization and performance Hierarchical porous kaolinite microspheres for leakage-resistant Abstract The growing global energy demand and environmental concerns necessitate innovative thermal energy storage solutions. Phase change materials (PCMs), particularly organic PCMs Inorganic hollow microsphere based energy storage phase change To address this challenge, integrating energy storage media is essential. Phase change materials (PCMs) have the advantages of high energy storage density, low

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