Alumina phase change energy storage

Are phase change materials suitable for thermal energy storage?
Phase change materials (PCMs) having a large latent heat during solid-liquid phase transition are promisingfor 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.

Are metallic phase-change materials suitable for high-temperature thermal energy storage?
High corrosivity, leakage, and oxidation of metallic phase-change materials (PCMs) have limited their applications in high-temperature thermal energy storage (TES) systems, regardless of their favorable benefits for high-temperature TES applications of over 1000 °C.

Can al/al2o3 form stable PCM be used for high-temperature thermal energy storage?
Conclusions To overcome the poor shape stability and corrosion issue of metallic material,a novel Al/Al2O3 form- stable PCM wasfabricated for high-temperature thermal energy storage. Phase change material Al and skeleton material Al2O3 were two main components.

How are alumina phases made?
We first fabricate a series of alumina phases,d-,th&d- and a-Al 2 O 3,by direct calciningg-Al 2 O 3 at 900,1000 and 1200 °C for 2 h,respectively. We then prepare CaO@g-Al 2 O 3,CaO@d-Al 2 O 3,CaO@th&d-Al 2 O 3 and CaO@a-Al 2 O 3 composites based on those novel alumina phases.

How alumina is synthesized?
Firstly,different alumina phases are synthesized through directly calcining g-Al 2 O 3 phase at specific temperatures(Fig. 1b,c). Secondly,the resulting x-Al 2 O 3 (where x includes g,d,d&th and a) is mixed with calcium acetate and then further sintered under an air atmosphere (Fig. 1b,c).

Can PCM be used as thermal energy storage material?
Therefore,several studies on PCM used as thermal energy storage material have been reported[9 - 14]. Phase change materials for thermal energy storage must have a large latent heat and a high thermal conductivity,a melting temperature in the practical range of operation,chemical stability,and must be low-cost,non-toxic,and non-corrosive.

To clarify the formation of intermediate phases in CaO@x-Al 2 O 3 composites induced by different alumina phases, we calculate the Gibbs free energy change (DG) of a reaction between CaO and...

Modified gamma alumina/fatty acids composite phase change materials (PCMs) were prepared via encapsulation with poly(St-co-DVB) shell by phase inversion emulsification method. The gamma alumina ... Thermal energy storage with phase change materials (PCMs) is of great concern for energy conservation due to its characteristics of high latent heat ...

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The research on phase change materials (PCMs) for thermal energy storage systems has been gaining momentum in a quest to identify better materials with low-cost, ease of availability, improved thermal and chemical stabilities and eco-friendly nature. The present article comprehensively reviews the novel PCMs and their synthesis and characterization techniques ...

Form-stable phase change materials (FSPCMs) with excellent photothermal conversion efficiency could achieve simultaneously conversion of solar energy to thermal energy and storage of the obtained thermal energy, and thus are beneficial for alleviating energy crises and environmental pollution. In the presented work, acid treated multiwalled carbon nanotubes ...

A new shape-stabilized composite phase change material (SSCP) was fabricated by using a promising matter, namely n-octadecane (n-OD) having 200-244.00 kJ kg-1 thermal energy storage capacity. For this aim, one step impregnation method was conducted in order to obtain the composite PCM. Nano-sized gamma alumina (g-Al2O3) was used as the ...

DOI: 10.1016/J.RSER.2016.12.009 Corpus ID: 114721176; Thermal Conductivity Enhancement of Treated Petroleum Waxes, As Phase Change Material, by A Nano Alumina: Energy Storage

A new shape-stabilized composite phase change material (SSCP) was fabricated by using a promising matter, namely n-octadecane (n-OD) having 200-244.00 kJ kg-1 thermal energy storage capacity.

Phase change materials (PCMs) are ideal carriers for clean energy conversion and storage due to their high thermal energy storage capacity and low cost. During the phase transition process, PCMs are able to store thermal energy in the form of latent heat, which is more efficient and steadier compared to other types of heat storage media (e.g ...

The use of phase change material (PCM) is being formulated in a variety of areas such as heating as well as cooling of household, refrigerators [9], solar energy plants [10], photovoltaic electricity generations [11], solar drying devices [12], waste heat recovery as well as hot water systems for household [13].The two primary requirements for phase change ...

Phase change thermal energy storage has the advantages of high thermal energy storage density and small temperature change range during the phase change process, and has broad application prospects for promoting renewable energy utilization and strengthening thermal management of power devices [1], [2], [3].As the core of phase change thermal ...

Abstract Alumina (Al2O3) is an inorganic shell material with desirable properties such as high thermal conductivity, chemical stability, resistance to corrosion and high thermal diffusivity. In this work, microcapsules with myristic acid (MA) core and alumina shell were generated by sol-gel technique. Aluminum isopropoxide (AIP) has been used as a shell ...

This overall energy storage density exceeds the reported value of 255.2 J/g for Al-C embedded composite phase change materials found in the literature [50]. Hence, it proves the effectiveness of the oxidation pre-treatment method employed in this study to enhance the energy storage density of composite phase change materials.

@article{Liu2023ThermalPO, title={Thermal property optimization and shape stabilization of sugar alcohols phase change thermal energy storage materials reinforced by sintering synthesized alumina porous ceramics}, author={Chenzhen Liu and Qingjiang Cheng and Peixing Du and Xue Wang and Mingming Wu and Zhonghao Rao}, journal={Journal of Energy ...

as Phase Change Materials for Thermal Energy Storage Application Sandip Khobragade Department of Mechanical Engineering National Institute of TechnologyTiruchirappalli - 620 015India. khobragade48@gmail Abstract:- In this work, we describe the characterization of Erythritol as a phase change material by adding 0.5%

DOI: 10.1021/ACSANM.9B00649 Corpus ID: 195580649; Size-Tunable Alumina-Encapsulated Sn-Based Phase Change Materials for Thermal Energy Storage @article{Zhu2019SizeTunableAS, title={Size-Tunable Alumina-Encapsulated Sn-Based Phase Change Materials for Thermal Energy Storage}, author={Shilei Zhu and Mai Thanh Nguyen ...

The integration of photo-thermal conversion and thermal energy storage is an efficient way to improve the solar energy utilization. Phase change material (PCM) with excellent thermal storage ability is often used in solar energy storage systems. However, PCMs suffer from liquid leakage, low thermal conductivity and insensitivity to light.

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