

Are phase change materials suitable for thermal energy storage?

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 ($<10 \text{ W/(m} \cdot \text{K)}$) limits the power density and overall storage efficiency.

What is 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 conversion carriers, can passively store energy and respond to changes in light exposure, thereby enhancing the efficiency of energy systems.

What is a phase change material (PCM)?

The global energy transition requires new technologies for efficiently managing and storing renewable energy. In the early 20th century, Stanford Olshansky discovered the phase change storage properties of paraffin, advancing phase change materials (PCMs) technology.

How much research has been done on phase change materials?

A thorough literature survey on the phase change materials for TES using Web of Science led to more than 4300 research publications on the fundamental science/chemistry of the materials, components, systems, applications, developments and so on, during the past 25 years.

Are phase change materials encapsulated inside cylindrical enclosures solidified?

Kalaiselvam et al. investigated the solidification and melting of the phase change materials encapsulated inside the cylindrical enclosures. Two models for solidification and three models for melting were used to find the interface locations at various time steps.

What is eutectic phase change material?

A eutectic phase change material composed of boric and succinic acids demonstrates a transition at around $150 \text{ }^\circ\text{C}$, with a record high reversible thermal energy uptake and thermal stability over 1,000 heating-cooling cycles.

Photothermal phase change energy storage materials (PTPCESMs), as a special type of PCM, can store energy and respond to changes in illumination, enhancing the efficiency of energy systems and demonstrating marked potential in solar energy and thermal management systems.

The management of energy consumption in the building sector is of crucial concern for modern societies. Fossil fuels' reduced availability, along with the environmental implications they cause, emphasize the

necessity for the development of new technologies using renewable energy resources. Taking into account the growing resource shortages, as well as ...

PCMs represent a novel form of energy storage materials capable of utilizing latent heat in the phase change process for thermal energy storage and utilization [6], [7]. Solid-liquid PCMs are now the most practical PCMs due to their small volume change, high energy storage density and suitable phase transition temperature. However, solid-liquid PCMs still face challenges such ...

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Abstract. Phase change materials (PCMs) have shown their big potential in many thermal applications with a tendency for further expansion. One of the application areas for which PCMs provided significant thermal performance improvements is the building sector which is considered a major consumer of energy and responsible for a good share of emissions. In ...

Thermal energy harvesting and its applications significantly rely on thermal energy storage (TES) materials. Critical factors include the material's ability to store and release heat with minimal temperature differences, the range of temperatures covered, and repetitive sensitivity. The short duration of heat storage limits the effectiveness of TES. Phase change ...

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In a recent issue of *Angewandte Chemie*, Chen et al. proposed a new concept of spatiotemporal phase change materials with high supercooling to realize long-duration storage and intelligent release of latent heat, inspiring the design of advanced solar thermal fuels.

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