

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 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.

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.

Are functional phase change materials reversible?

Functional phase change materials (PCMs) capable of reversibly storing and releasing tremendous thermal energy during the isothermal phase change process have recently received tremendous attention...

Can polymers be used in phase change energy storage?

It offers a wide range of options for energy storage and application. The use of polymers in phase change energy storage offers opportunities for designing more efficient and sustainable energy systems, considering factors such as shape stability, flexibility, and multifunctionality.

Why are phase change heat storage materials becoming more popular?

This upward trend signifies the growing interest and attention directed towards phase change heat storage materials. It is a reflection of the increasing global recognition and adoption of low-carbon energy conservation and sustainable development principles. Fig. 2.

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Phase change materials (PCMs) are materials that can undergo phase transitions (that is, changing from solid to liquid or vice versa) while absorbing or releasing large amounts of energy in the form of latent heat.

The materials used for latent heat thermal energy storage (LHTES) are called Phase Change Materials (PCMs) [19]. PCMs are a group of materials that have an intrinsic capability of absorbing and releasing heat during phase transition cycles, which results in the charging and discharging [20].

Functional phase change materials (PCMs) capable of reversibly storing and releasing tremendous thermal energy during the isothermal phase change process have recently received tremendous attention in interdisciplinary applications.

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Conventional phase change materials struggle with long-duration thermal energy storage and controllable latent heat release. In a recent issue of *Angewandte Chemie*, Chen et al. proposed a new concept of spatiotemporal phase change materials with high super-cooling to realize long-duration storage and intelligent release of

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This review focuses on three key aspects of polymer utilization in phase change energy storage: (1) Polymers as direct thermal storage materials, serving as PCMs themselves; (2) strategies for the development of shape-stable PCMs based on polymers, including vacuum impregnation, direct blending, chemical grafting,

electrospinning ...

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