

# Analysis of working environment of phase change energy storage

Are phase change materials suitable for thermal energy storage?

Volume 2, Issue 8, 18 August 2021, 100540 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.

Do phase change materials affect TES efficiency?

In this regard, choosing type of Phase Change Materials (PCMs) that are widely used to control heat in latent thermal energy storage systems, plays a vital role as a means of TES efficiency. However, this field suffers from lack of a comprehensive investigation on the impact of various PCMs in terms of exergy.

What are phase change materials (PCMs)?

In this context, phase change materials (PCMs) have emerged as key solutions for thermal energy storage and reuse, offering versatility in addressing contemporary energy challenges.

Is there a conflict of interest in a thermal energy storage system?

On behalf of all authors, the corresponding author states that there is no conflict of interest. Taheri, M., Pourfayaz, F., Habibi, R. et al. Exergy Analysis of Charge and Discharge Processes of Thermal Energy Storage System with Various Phase Change Materials: A Comprehensive Comparison. J. Therm.

What is thermal energy storage (TES)?

Thermal energy storage (TES) is of great importance in solving the mismatch between energy production and consumption. In this regard, choosing type of Phase Change Materials (PCMs) that are widely used to control heat in latent thermal energy storage systems, plays a vital role as a means of TES efficiency.

How does a PCM control the temperature of phase transition?

By controlling the temperature of phase transition, thermal energy can be stored in or released from the PCM efficiently. Figure 1 B is a schematic of a PCM storing heat from a heat source and transferring heat to a heat sink.

Haowei Hu a School of Environment and Energy Engineering, Anhui Jianzhu ... The effects of applying a phase-change energy storage wall in office buildings in hot summer and cold winter climate zones were analyzed by comparing several factors based on numerical calculations, specifically focusing on the internal and external wall temperature ...

Thermal energy storage (TES) is of great importance in solving the mismatch between energy production and consumption. In this regard, choosing type of Phase Change ...

Domanski and Fellah [25] established a mathematical model of the heat storage and release process of a 2-stage phase change heat storage device and discussed the effect of phase change temperature on the temperature distribution and unit energy storage rate of PCMs by numerical simulation based on the second law of thermodynamics. The results show that ...

The organization of the article is as follows: Types of Cooling Techniques, PCM Working Mechanism, and PCM Application is elaborated in Sect. 2 followed by a summary of phase change material, types of phase change material, and incorporation technique analysis in Sect. 2. The experimental analysis and software simulation of PCM composites used in ...

Although phase change heat storage technology has the advantages that these sensible heat storage and thermochemical heat storage do not have but is limited by the low thermal conductivity of phase change materials (PCM), the temperature distribution uniformity of phase change heat storage system and transient thermal response is not ideal. There are ...

The global electricity demand, escalating fossil fuel prices, and serious problems about global warming have re-energized the idea of aggressively migrating to renewable energy (RE) sources, particularly over the past two decades [192]. Out of all other renewable energy sources, solar energy is the most efficient energy source, as it is environmentally friendly, ...

One type of thermal energy storage is latent heat storage, which makes use of the large amount of enthalpy that can be stored during the phase change of a storage material, and is an ...

Box-type phase change energy storage thermal reservoir phase change materials have high energy storage density; the amount of heat stored in the same volume can be 5-15 times that of water, and the volume can also be 3-10 times smaller than that of ordinary water in the same thermal energy storage case [28]. Compared to the building phase change ...

Given the limitations of above-mentioned traditional tunnel cooling methods, our research team proposed an innovative cooling method of utilizing phase change material (PCM) plates to reduce the high ambient temperature inside the tunnel [16]. This method innovatively combined the shallow geothermal energy extraction technology (i.e., utilizing ...

Solar energy is more efficient and abundant when compared to other renewable sources. Thus, in this context, a single slope solar desalination system with energy storage (phase change materials - PCMs) is designed and developed to analyze the Energy, Exergy, Economic and Environmental (4 - E) performance.

Compressed air energy storage (CAES) technology is one of the important technologies to address the instability of renewable energy sources. To further make full use of the system heat of compression and reduce

# **Analysis of working environment of phase change energy storage**

the problem of energy grade dissipation inside the accumulator, this paper proposes a novel CAES system coupled with a graded phase change ...

Web: <https://vielec-electricite.fr>