

Can phase change material enhanced concrete improve thermal energy storage?

Phase change material (PCM)-enhanced concrete offers a promising solution by enhancing thermal energy storage (TES) and reducing energy demands for heating and cooling in buildings. However, challenges related to PCM leakage, mechanical strength reduction, and encapsulation durability hinder widespread adoption.

Can phase-change materials be used in concrete?

The use of phase-change materials (PCM) in concrete has revealed promising results in terms of clean energy storage. However, the negative impact of the interaction between PCM and concrete on the mechanical and durability properties limits field ...

Can phase change material and carbon nanofibers be used for thermal energy regulation?

96. Ren M., Liu Y., Gao X. Incorporation of phase change material and carbon nanofibers into lightweight aggregate concrete for thermal energy regulation in buildings. *Energy*. 2020;197:117262. doi: 10.1016/j.energy.2020.117262.

Can PCMS reduce thermal energy demand in concrete?

Additionally, this review explores the thermal energy regulation of PCMs in concrete, focusing on integration methods like microencapsulation and vacuum impregnation while maintaining structural integrity. Practical applications demonstrate that PCMs help mitigate temperature fluctuations, enhancing indoor comfort and reducing energy demand.

Can phase-change materials improve thermal comfort?

In fact, the application of phase-change materials (PCM) to enhance the TES for thermal comfort is widely accepted. PCM is recognized as a potential game changer in the field of sustainable infrastructure development and is also feasible for built environment sustainability .

How can PCM encapsulation improve the thermal performance of concrete?

Recent research has focused on enhancing the thermal performance of concrete through various methods of PCM incorporation, including direct mixing into the concrete matrix, microencapsulation to prevent leakage, and vacuum impregnation, all of which aim to optimize energy storage and release within the building envelope .

For building applications and especially their integration into walls and wallboards, only solid-liquid PCMs are used and are available with a wide range of phase change temperatures on the ...

Phase change materials (PCMs) have gained attention as a promising solution for improving energy efficiency and indoor thermal comfort in buildings. This review explores the ...

The soaring global demand for renewable energy and building energy efficiency has significantly propelled the application of phase-change thermal storage walls in passive building ...

Nanostructures encapsulated phase change materials for sustained thermal energy storage in concrete: An overall assessment

Phase Change Materials (PCMs) are increasingly recognized in the construction industry for their ability to enhance thermal energy storage and improve building energy efficiency. ...

Abstract. Sustainability awareness in the building industry has increased in recent years, and several initiatives have been developed. One of the areas gaining attention recently is the application of ...

This review explores the widespread applications of phase change materials (PCMs) in various solar energy systems, emphasizing their role in enhancing energy storage efficiency.

Phase change energy storage plays an important role in the green, efficient, and sustainable use of energy. Solar energy is stored by phase change materials to realize the time and space ...

The present review is an extensive overview of the research progress obtained in the field of Phase Change Material (PCM) integrated with solar thermal applications. Solar energy has ...

The ability of phase change materials to store significant amounts of heat during their phase transition over a constrained temperature range make them attractive candidates for ...

This research provides a comprehensive overview of possible heating and cooling methods in buildings using Phase change materials (PCMs). ...

Based on previous research and the energy storage characteristics of phase change materials, this paper proposes a method of converting solar radiation energy into concrete box girder ...

The Thermal energy storage using phase change materials are applicable in variety of application solar water-heating storage systems as well as solar air heating storage systems, solar ...

Applications of phase change materials (PCMs) have become of great interest in recent years owing to beneficial effects on the thermal, mechanical and durability properties of ...

Global climate change is today's biggest threat, encompassing rising extreme temperature events. The increase in the thermal mass of the building envelope by adding phase ...

One of the possible solutions is the use of Phase change materials (PCMs). The PCMs refer to substances that transition between liquid <-> solid phases, often referred to as the "melting ...

Phase change materials are capable of absorbing and releasing energy based on the temperatures they are exposed to. However, as it is well known that the incorporation of any material ...

Phase change material (PCM)-enhanced concrete offers a promising solution by enhancing thermal energy storage (TES) and reducing ...

The objective of this review article is to evaluate current phase change materials applications in cooling systems. The investigations about the application of PCMs in cooling systems ...

\* Corresponding author; E-mail: liuzhongbao@bjut .cn Phase change energy storage plays an important role in the green, efficient, and sustainable use of energy. Solar energy is stored by phase ...

Lower thermal conductivity of the decoration layer is helpful in application. Application of phase change material (PCM) floor in a solar water heating system can greatly enhance the floor's ...

A promising pathway to achieving significant energy savings within these strategies is through the incorporation of phase change materials (PCMs) in building materials, especially in ...

Practical applications demonstrate that PCMs help mitigate temperature fluctuations, enhancing indoor comfort and reducing energy demand. However, despite their energy-saving ...

Phase Change Materials (PCMs) are "latent" thermal storage materials possessing a large amount of heat energy stored during its phase change stage [1]. The energy required to change ...

With increasing copper powder incorporation rate, the thermal conductivity and compressive strength of phase change energy storage concrete exhibit a linear increase.

The use of renewable energy sources as solar energy for substituting fossil fuels in the industry proved to be viable. Concentrating solar power plants with a thermal storage system (both ...

Therefore, the present study focuses on three aspects: PCM type, the effect of PCM on concrete properties, and connecting the outcome of PCM concrete composite ...

Application of thermal energy accumulators based on paraffin phase change materials in convective-vacuum impulsive drying units: A brief ...

Concrete bricks serve as versatile building components, offering not only structural integrity but also

multifaceted benefits such as noise reduction, low maintenance, and enhanced fire ...

As the pavement temperature reaches above the phase change temperature of PCM, it undergoes phase change by absorbing heat energy from the pavement and contribute towards the ...

The primary goal of this research is to determine whether solar stills may be made more efficient during the day and night by increasing their yield with the help of stones made of Phase ...

Phase change energy storage plays an important role in the green, efficient, and sustainable use of energy. Solar energy is stored by phase change ...

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