

# Phase change energy storage concrete

Can phase change materials enhance concrete's thermal energy storage capabilities?

The integration of phase change materials (PCMs), explored by researchers like Khudhair & Farid and Soares et al., augments concrete's thermal energy storage capabilities. These endeavours broaden the potential applications of concrete-based TES systems, making them versatile and efficient.

What are phase change materials (PCMs) in concrete?

Phase Change Materials (PCMs) in concrete Phase Change Materials (PCMs) are substances with exceptional thermal energy storage properties, allowing them to store and release large amounts of heat energy during phase transitions. These transitions occur when PCMs change from one physical state to another, such as solid to liquid or liquid to gas.

Do phase change energy storage particles have good thermal properties?

Applied Materials Citation Yichao Zhang et al 2020 J. Phys.: Conf. Ser. 1549 032110 Phase change energy storage particles have excellent thermal properties. The phase change energy storage concrete prepared by adding phase change energy storage particles to concrete has excellent mechanical properties and thermal properties of concrete.

Are phase change materials suitable for building thermal energy storage?

This characteristic makes PCM an ideal candidate for building thermal energy storage (TES). The incorporation of phase change materials (PCMs) in building materials has attracted a lot of research interest due to the concern on energy efficiency.

What types of phase change materials are used in concrete?

There are two types of phase change materials (PCMs) that are commonly used in concrete: inorganic and organic. Inorganic PCM has high volumetric heat storage capacity and good thermal conductivity. Moreover, it is cheap and nonflammable. The most common inorganic PCMs are hydrated salts.

Can phase change materials reduce energy consumption in building materials?

The possible incorporation of phase change materials (PCMs) in building materials has attracted a lot of research interest worldwide due to the concern on global warming and the ability of PCMs to reduce energy consumption in building because of their thermal energy storage abilities.

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 ...

Preparation and characterization of novel phase-change concrete based on different porous phase-change aggregates: Comprehensive comparison of various phase change composites ... Recent developments in phase change materials for energy storage applications: a review. Int J. Heat. Mass Tran, 129 (2019), pp. 491-523,

10.1016/j.ijheatmasstransfer ...

This study explores phase change hysteresis in energy storage concrete slabs, focusing on the impact of microcapsule concentration and temperature change rate on thermal efficiency. Experiments were conducted to analyze the thermophysical properties, particularly observing the variations in specific heat capacity and phase transition temperatures.

Energy storage in the walls, ceiling and floor of buildings may be enhanced by encapsulating suitable phase change materials (PCMs) within these surfaces to capture solar energy directly and ...

Phase-change energy storage concrete (GPEP) model piles based on Gum Arabic with polyethylene glycol 600 were poured. Traditional energy piles (TEP) were poured with ordinary concrete for control testing. The ultimate load capacity of single GPEP and TEP piles after multiple hot and cold cycles were calculated and analyzed compared to the ...

DOI: 10.1016/J.PROENV.2016.02.030 Corpus ID: 137907862; The Preparation of Phase Change Energy Storage Ceramsite from Waste Autoclaved Aerated Concrete @article{Tielin2016ThePO, title={The Preparation of Phase Change Energy Storage Ceramsite from Waste Autoclaved Aerated Concrete}, author={Fan Tielin and Chen Mimi and Zhao Fengqing}, journal={Procedia ...

Review Use of phase change materials for thermal energy storage in concrete: An overview Tung-Chai Ling,a, Chi-Sun Poon,a Department of Civil and Environmental Engineering, The Hong Kong ...

In order to study the heat transfer efficiency of phase change concrete, this paper simulates the working environment of phase change energy piles in summer of Norther China, i.e., taking the summer room temperature of 35? as the inlet water temperature, and the underground soil temperature of 15? as the outlet water temperature, and ...

DOI: 10.1016/J.NBUILDMAT.2013.04.031 Corpus ID: 136709789; Use of phase change materials for thermal energy storage in concrete: An overview @article{Ling2013UseOP, title={Use of phase change materials for thermal energy storage in concrete: An overview}, author={Tung-chai Ling and Chi sun Poon}, journal={Construction and ...

Tests were carried out according to the provisions of Chinese specifications JGJ/T12-2019 [23], and the baseline mix ratio for phase-change CCS concrete was determined as detailed in Table 2 for PCM-0 %. As shown in Fig. 1, the composite aggregate was prepared by using a vacuum device to adsorb paraffin into the CCS. Through two-layer encapsulation to ...

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 ...

To prepare Phase Change Energy Storage Permeable Concrete (PCESPC) with excellent thermodynamic performance, it is necessary to determine the optimal volume fraction of Microencapsulated Phase Change Material (MPCM), volume fraction of Carbon Nanotubes (CNTs), and Water-Binder ratio (W/B).

The phase change energy storage concrete prepared by adding phase change energy storage particles to concrete has excellent mechanical properties and thermal properties of concrete. Choosing appropriate phase change materials and mix proportion can effectively reduce the energy consumption of concrete buildings on the premise of meeting the ...

Using FSPCM as phase change aggregates to prepare thermal storage concrete is an effective way to achieve passive building energy conservation. Sukontasukkul [ 18 ] et al. replaced ordinary ceramsite with the phase change aggregate (ceramsite/PCMs) to prepare thermal storage 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 applications, leading to a shift of the research to incorporate PCM into concrete using different techniques to ...

This study explores the feasibility of utilizing pervious concrete (PC) incorporating diverse lightweight aggregates (LWAs) integrated with phase change materials (PCM) for ...

Phase change material (PCM) for thermal energy storage (TES) is the material that can absorb energy during heating process as phase change takes place and release energy to environment during cooling process. Nowadays, energy consumption trends in construction building show a significant increase.

Phase diagrams, eutectic mass ratios and thermal energy storage properties of multiple fatty acid eutectics as novel solid-liquid phase change materials for storage and retrieval of thermal energy Appl. Therm. Eng., 113 ( 2017 ), pp. 1319 - 1331, 10.1016/j.applthermaleng.2016.11.158

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2013, Construction and Building Materials. The possible incorporation of phase change materials (PCMs) in building materials has attracted a lot of research interest worldwide due to the concern on global warming and the ability of ...

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 ...

The incorporation of PCMs in conventional building and construction materials can be used to curb the energy demands of infrastructure. As concrete is widely used construction material, it is estimated that worldwide consumption of concrete in present is of the order of over 11 billion metric ton [10]. The specific heat capacity of concrete with an assumed unit weight of ...

Thermal storage is very relevant for technologies that make thermal use of solar energy, as well as energy savings in buildings. Phase change materials (PCMs) are positioned as an attractive alternative to storing thermal energy. This review provides an extensive and comprehensive overview of recent investigations on integrating PCMs in the following low ...

The application of thermal energy storage with phase change materials (PCMs) for energy efficiency of buildings grew rapidly in the last few years. In this research, octadecane paraffin was served as a PCM, and a structural concrete with the function of indoor temperature control was developed by using a macro-encapsulated PCM hollow steel ball (HSB).

The thermal properties and heat transfer of this TES material will stimulate thermal energy storage in concrete. Phase change material (PCM) as a latent heat storage was used as application in building show had high potential can be used in passive cooling and heating strategies in Europe [1]. Moreover, it has been found that PCM helps indoor ...

M. Amar, M. Mohamed, A review on energy conservation in building applications with thermal storage by latent heat using phase change materials, *Energy Convers. Manag.* 45, 263-275 (2004) [Google Scholar]

"Utilization of macro encapsulated phase change materials for the development of thermal energy storage and structural lightweight aggregate concrete." *Appl. Energy*, 139(1), 43-55. Crossref

Abstract A unique substance or material that releases or absorbs enough energy during a phase shift is known as a phase change material (PCM). Usually, one of the first two fundamental states of matter--solid or liquid--will change into the other. Phase change materials for thermal energy storage (TES) have excellent capability for providing thermal ...

"A review on energy conservation in building applications with thermal storage by latent heat using phase change materials" by Khudhair et al. (2004) [22] from the journal *Energy Conversion and Management*, is the most cited paper in query 1 (Table 3), with 915 citations overshadows the rest of publications. This review paper is focused on ...

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