

# Energy storage phase change concrete

This review explores the potential of incorporating Phase Change Materials (PCMs) directly into concrete as an embedded insulation system. As a latent heat storage material, PCM offers promising fire-resistant properties, reducing the need for external insulation while improving the fire performance of concrete.

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]

**Key Words:** Phase Change Materials, Concrete, ... In early stage of development of thermal energy storage concrete, impregnation is used as the method of incorporation. Hawes et al. (1990) has ...

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.

This study delves into the integration of Phase Change Materials (PCM) into concrete bricks, exploring the potential of PCM to address global warming implications by reducing energy consumption and improving indoor comfort. ... Al-Hallaj S (2004) A review on phase change energy storage: materials and applications. *Energy Convers Manage* 45(10 ...

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.

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.

Cold thermal energy storage (CTES) based on phase change materials (PCMs) has shown great promise in numerous energy-related applications. Due to its high energy storage density, CTES is able to balance the existing energy supply and demand imbalance. Given the rapidly growing demand for cold energy, the storage of hot and cold energy is emerging as a ...

"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 ...

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 ...

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 ...

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).

Request PDF | Application of Phase Change Material (PCM) in Concrete for Thermal Energy Storage | Phase Change Material (PCM) has the ability to absorb and to release a large amount of latent heat ...

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 use 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 ...

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

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

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 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.

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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 ...

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.

The thermal conductivity and compressive strength of PCM-concrete thermal storage blocks decreased with the increase of PCM weight percentage, and the average specific heat capacity increased by 12.54% (2 wt% PCM), 31.60 (4 wt% PCM) and 41.23% (6 wt% PCM), respectively. ... Due to the fact that materials release energy phase change during phase ...

Recent research has focused on enhancing the thermal performance of concrete through various methods of PCM incorporation, including direct mixing into the concrete matrix, ...

A dynamically tunable temperature innovative energy storage concrete with hierarchical porous microspheres was developed by crosslinking palygorskite nanofibers and cellulose nanocrystals for the thermal management of buildings. ... The energy storage density and phase change temperatures are two critical indicators used to evaluate the latent ...

Thus, a great deal of attention has been devoted in recent years, in addressing the energy challenges in buildings through the integration of thermal energy storage (TES) systems using phase change materials (PCMs) [5, 13, 14] short, the PCM is a type of material which can store and release the thermal energy through a phase transition process at near ...

"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

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

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 ...

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 PCMs to reduce energy consumption in building because of their thermal energy storage

abilities.

In this paper, a novel strategy of concrete curing was developed by solar thermal energy storage based on phase change material (PCM), in order to prevent concrete from frost damage at early age and promote the rapid growth of concrete strength in cold climate. ... Moreover, EHS/mRHA was acted as TESL integrated into the curing structure based ...

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.

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