

Enhancing thermal energy storage capacity of building envelope by incorporating PCM in the building element such as bricks, cement, concrete, mortar, tiles, and wallboards will reduce the heat penetration from external environment to internal environment [7] consequently, the utilization of space cooling equipment's will also reduce and leads to energy savings.

In this study, phase change material (PCM) was encapsulated in a novel aluminium-based macro-capsule and indirectly applied to cement-based mortar to address ...

To explore the application of phase change energy storage materials in building energy conservation, in this study, an innovative composite thermal energy storage cement mortar (CTESCM) was ...

By storing excess thermal energy during periods of low demand or high energy production, concrete matrix heat storage systems contribute to energy efficiency and load ...

Technologies for storing mechanical, electrical, chemical, and thermal energy have been introduced for large-scale applications [1]. Among these, thermal energy storage materials employing phase change materials (PCMs) have broad application prospects because of their large phase-change enthalpy and capability to store enthalpy of heating at constant ...

The phase change energy storage mortar has good thermal performance and energy storage and temperature regulation capability while meeting the requirements of mechanical properties, ...

The implementation of energy storage temperature regulating mortars offers numerous benefits that extend beyond mere thermal comfort within a building. One of the ...

AbstractPhase change material (PCM) is a strategic choice for storing energy and regulating the building temperature. It has been successfully integrated into cement-based materials, significantly affecting mechanical properties. The main feature of PCM ...

To explore the application of phase change energy storage materials in building energy conservation, in this study, an innovative composite thermal energy storage cement mortar...

The invention relates to phase change temperature adjustment mortar. The phase change temperature adjustment mortar is novel dry powdery mortar with functions of temperature adjustment and heat preservation, and is prepared through the process that a part or all of aggregates in ordinary plastering mortar or heat insulating mortar are substituted with an ...

In light of the urgent demand for enhanced temperature control within the realm of construction and building applications, this research presents an innovative shape-stabilized phase change material (PCM). Effective thermal energy storage has been made possible by combining myristic acid (MA) and lauric acid (LA) with sepiolite in cement mortars. These ...

A phase change energy storage and phase change temperature technology, which is applied in the field of building materials, can solve the problems that phase change mortar is difficult to exert energy storage and temperature regulation functions for a long time, reduce the strength of hardened mortar, and it is difficult to obtain energy storage and temperature regulation functions.

Recycled glass enhances phase-change materials in mortar, promoting eco-friendly construction. Customized PCM-integrated walls show substantial energy savings in various ...

Solar thermal energy efficiency of cementitious mortar is enhanced by introducing a phase change material (PCM) with thermal energy harvesting/releasing ability. Within this framework, a new type of cement based-thermal energy storage mortar (CBTESM) was developed by substituting blast furnace slag (BFS)/capric acid (CA) shape-stabilized PCM ...

For instance, Sari et al. [35] absorbed 28 wt% of eutectic capric acid/myristic acid (CA-MA) in cement to develop thermal regulating mortar with latent heat storage of 39.56-41.78 J/g. The developed thermal regulating mortar had thermal inertia of 0.78 °C.

The mechanical properties of concrete incorporating 10 and 20% PCM by volume were investigated by Fernandes et al. [16]. The results from their study presented in Fig. 3 showed that the incorporation of PCMs into concrete led to a decrease in its compressive strength. However, the use of silica fume alongside ordinary Portland cement as a binder was found to ...

The increasing shortage of energy has forced the world to improve the efficiency of energy use and to utilize renewable energy sources. With the rapid development of the construction industry and the improvement of living standards, the energy consumption of buildings has continued to increase, accounting for about one third of the total energy ...

A technology of phase change energy storage and phase change temperature, which is applied in the field of building materials, can solve the problems of high cost of phase change microcapsules, loss of energy storage and temperature regulation function, and difficulty in long-term performance of energy storage and temperature regulation effects of phase change ...

Therefore, the need of the hour is to develop energy-efficient building envelope for optimizing the end-use of energy in buildings. Enhancing the thermal energy storage capacity of the building envelope by incorporating

PCM is one ...

Corresponding author's e-mail: wuxiangxiang@succ.cn Review on phase change materials and application in building energy saving Xiangxiang Wu^{1} 1 Shanghai urban construction vocational college, Shanghai 200438, China Abstract: Phase change materials (PCMs) can be used for thermal energy storage and temperature regulation

Addressing the challenges of energy storage liquid leakage and long-term stability in energy storage is crucial for achieving sustainable energy efficiency. In this study, polymethyl methacrylate (PMMA) is innovatively employed as an encapsulation film on the surface of the wood-based phase change material, resulting in a recyclable wood-based ...

Thermal energy storage (TES) presents the viability to provide energy savings and can decrease the usage and environmental impacts of fossil-based energy sources [1], [2]. Latent heat thermal energy storage (LHTES) is the most efficient and commonly preferred TES method because it allows to store and release heat high latent heat per unit volume of a phase change ...

The result revealed that the average annual building energy and peak summer temperature were reduced by 5% and 4.1 °C, respectively, after thermal inertia of the composite PCMs were maintained. ... phase-change composites and fabrication of dynamic cross-linked composite PCMs have been recommended for prolonged energy storage and thermal ...

The results confirmed that the thermal conductivity of the nano-PCM was more than 100 % greater than that of raw PCM. Furthermore, the high-efficiency thermal energy storage cementitious composite was able to maintain the temperature above 0 °C when the ambient temperature was -5 °C, demonstrating its superior thermal energy storage performance.

Such an approach allows the regulation of the temperature inside buildings through latent heat energy storage, using only solar energy as a resource, thus, reducing the need for ...

Energy consumption in buildings is increasing sharply due to rising living standards and population growth. Currently, the building sector accounts for approximately 40 % of global energy consumption [1]. This energy is predominantly used to maintain thermal comfort within buildings, primarily through Heating, Ventilation, and Air Conditioning (HVAC) systems.

Direct incorporation of phase change materials (PCMs) in the mortar matrix increases the effective thermal mass of a structure without increasing the size or significantly ...

The depletion of nonrenewable resources, such as coal and oil [1, 2], has given rise to energy issues and is a major societal concern worldwide this context, the construction industry has emerged as a primary contributor

to energy consumption [3]. Statistics reveal [4] that energy consumption in the construction industry accounts for approximately 30-40 % of global ...

In this study, cement-based thermal energy storage composites (TESC) were developed by integrating a novel phase change material (PCM) composite into ordinary ...

The use of slag silicate cement mortar as a thermal mass layer for radiant floor heating systems holds significant potential for active thermal energy storage systems in buildings. The main objective of this article is to ...

Currently, the construction materials with small heat transfer coefficient are being used to retard the heat transfer. Nevertheless, traditional construction materials have low heat capacity, which is violence against suppressing indoor temperature fluctuations, and makes it difficult to realize the effective use of energy [5], [6], [7]. Adding the phase change material ...

It was observed that incorporating PCM can effectively improves the thermal energy storage capacity of the mortar. The [10] has incorporated low temperature organic PCM in cement mortar having transition temperature of $4.5 \pm 0.5^{\circ}\text{C}$, $2-2.5 \pm 0.5^{\circ}\text{C}$, and $-0.5 \pm 0.5^{\circ}\text{C}$. The result shows improvement in latent heat storage capacity of the cement mortar.

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