Phase change energy storage concrete for roads

How can a phase change material improve the thermal energy storage capacity of concrete?
Integrationof Phase Change Materials (PCMs): Investigating the integration of PCMs into concrete can enhance its thermal energy storage capabilities. Research can focus on developing new PCM-concrete composites or exploring the use of microencapsulated PCMs to enhance the latent heat storage capacity of concrete. 4.

Can phase change materials in concrete pavements store heat?
This paper investigates the potential use of phase change materials (PCM) in concrete pavements to store heat, which can be used to reduce ice formation and snow accumulation on the surface of the concrete pavement.

What type of phase change material is used in concrete?
J. Compos. Sci. Most concrete employs organic phase change materials(PCMs),although there are different types available for more specialised use. Organic PCMs are the material of choice for concrete due to their greater heat of fusion and lower cost in comparison to other PCMs.

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.

How can we improve the thermal energy storage capacity of concrete?
Research can investigate the effects of different additives and reinforcements on thermal conductivity,heat transfer and mechanical properties of concrete. 3. Integration of Phase Change Materials (PCMs):Investigating the integration of PCMs into concrete can enhance its thermal energy storage capabilities.

What is a phase change material?
Phase Change Materials (PCMs) exhibit high energy density and adaptability, undergoing phase transitions for efficient heat storage. Liquids, like molten salts, boast high thermal conductivity and wide operating temperatures. Metals offer excellent thermal conductivity but can be cost-prohibitive.

Chapter 17 - Nanostructures encapsulated phase-change materials for sustained thermal energy storage in concrete. Author links open ... used since the late 19th century as ...

Enhancing the compressive strength of thermal energy storage concrete containing a low-temperature phase change material using silica fume and multiwalled carbon ...

Hong C,Sheng J,Haoquan W, et al.Experimental study on the performance of phase change energy storage concrete for energy piles based on Gum Arabic and PEG ...

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In this study, a nanoengineered thermal-energy storing cementitious composite incorporated with a microencapsulated phase change material (m-PCM) and the combination ...

Laing D, Lehmann D, Fiß M (2009) Test results of concrete thermal energy storage for parabolic trough power plants. J Sol Energy Eng 131: 041007. doi: 10.1115/1.3197844 [86] Sharma A, Tyagi VV, Chen CR, et al. ...

In this study, low-cost thermal energy storage aggregates (TESA) were created with several different organic phase change materials (PCMs), possessing thermodynamic ...

Phase change material concrete as a new building envelope has been widely used in passive building energy conservation, but less research has been done for it as a heat ...

Overall, the results demonstrate that modified asphalt possesses both phase change thermal storage capability and radiative cooling ability, effectively reducing solar ...

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

The escalating global energy demand underscores the critical need for advanced solutions for energy-efficient buildings. Passive thermal energy storage systems using microencapsulated phase change materials (PCMs) ...

Mixing phase change material (PCM) into concrete has been proven effective of functionalizing concrete as an energy-storage unit [15, 16].Rashid et al. [17] summarized past ...

Zhang et al. [21] developed a phase-change energy storage permeable concrete (PCESPC), achieving excellent results in temperature regulation and frost resistance. Ying et ...

Phase change materials are capable of absorbing and releasing heat within a specific temperature range Joulin et al., 2011 [10]; [11], making them a research hotspot in the ...

Use of phase change materials in concrete: current challenges. Adeyemi Adesina * Concordia University, Montreal, Canada * e-mail: a_adesin@encs ncordia.ca. ... Use of ...

The materials used for latent thermal energy storage are phase changing materials (PCMs). Early research on PCMs and the latent thermal energy storage method in buildings ...

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

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To prepare Phase Change Energy Storage Permeable Concrete (PCESPC) with excellent thermodynamic performance, it is necessary to determine the optimal volume ...

This paper investigates the potential use of phase change materials (PCM) in concrete pavements to store heat, which can be used to reduce ice formation and snow ...

Phase Change Materials (PCMs) exhibit high energy density and adaptability, undergoing phase transitions for efficient heat storage. Liquids, like molten salts, boast high ...

The development of phase change energy storage technology promotes the rational utilization of renewable energy, and the core of this technology is phase change ...

Evaluating the use of phase change materials in concrete pavement to melt ice and snow. J. Mater. Civ. Eng., 28 (4) (2015), p. 04015161. Google Scholar ... Review on ...

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 ...

This study provides an overview of how phase change materials (PCMs) can improve the resistance of concrete pavement to freeze-thaw cycles and mitigate the urban heat island (UHI) effect. The investigation covers ...

The storage of clean energy via PCM significantly supports the UN SDG 7 target of affordable and clean energy. Therefore, the present study focuses on three aspects: PCM type, the effect of ...

Segun Jonathan Osibodu, Adekanmi Miracle Adeyinka, Onyedika Vincent Mbelu, Phase change material integration in concrete for thermal energy storage: techniques and ...

Choosing appropriate phase change materials and mix proportion can effectively reduce the energy consumption of concrete buildings on the premise of meeting the ...

One of the most promising methods for increasing the thermal energy storage of pavement is incorporating Phase change materials (PCMs). Incorporating PCMs into the ...

Another strategy to mitigate the UHI is developing Latent Heat Thermal Energy Storage (LHTS) capability using phase change materials (PCM) [42] [43][44][45]. Reducing the ...

Microencapsulated bio-based phase change material (MbP) incorporated into a micro-concrete composite (MbPMC) was created by Parameshwaran et al. (2021) [76] for use in thermal energy storage in buildings.

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The main reasons for restricting the development of this technology include the lack of suitability between the PCMs and asphalt pavement, the quantitative characterization of ...

Mixing phase change material (PCM) into concrete has been proven effective of functionalizing concrete as an energy-storage unit [15,16]. Rashid et al. [17] summarized past ...

During the transition from liquid to solid, PCMs release latent heat, which can keep the concrete warmer for a longer period [4]. This delay in temperature change has the ...

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