Asphalt adding latent heat storage material

How to absorb heat inside asphalt pavement?
Absorbing the heat inside the pavement is mainly achieved by adding PCMs (phase change materials) or setting an energy collection device. PCMs store heat in the form of latent heat when a phase change occurs,improving the heat storage capacity of asphalt mixtures and reducing the asphalt pavement temperature (Athukorallage et al. 2018).

Do PCMS store heat in a phase change asphalt mixture?
PCMs store heat in the form of latent heatwhen a phase change occurs,improving the heat storage capacity of asphalt mixtures and reducing the asphalt pavement temperature (Athukorallage et al. 2018). Wei et al. (2019) prepared a phase change asphalt mixture by replacing the fine aggregate with NiTi alloy phase change heat storage materials.

Does phase change heat storage asphalt mixture meet high-temperature performance requirement?
As can also be seen that the phase change heat storage asphalt mixtures with 20 vol% and 40 vol% PUSSPCM have dynamic stability values that are higher than the limit value of 2800 kN,meeting high-temperature performance requirementin JTG D50-2006. Fig. 13. Test results of high-temperature performance of phase change heat storage asphalt mixtures.

What is the construction temperature of hot mix asphalt pavement?
The construction temperature of hot-mix asphalt mixtures usually ranges from 160 °C to 185 °C,at which the phase change heat storage asphalt pavement materials should keep solid without obvious leakage to avoid the detrimental influence of the leaked PCM on the comprehensive performance of asphalt pavement.

Can CS-PCM improve the heat storage capacity of asphalt mixture?
The incorporation of CS-PCM can improve the heat storage capacityof asphalt mixture and reduce its temperature,but the modulus and high temperature stability of asphalt mixture will be reduced due to CS-PCM change from solid phase to liquid phase during the phase transition.

What factors affect the heat transfer of asphalt pavement?
5.2. Temperature Field of Phase Change Material-Modified Asphalt Pavement The heat transfer of the pavement is impacted by external elements,such as air temperature,solar radiation,wind,and rainfall,and internal factors,such as the form of pavement structure and the physical parameters of the pavement materials.

Latent heat storage technology is a high-density heat storage technology that can store energy in the form of phase change latent heat [[10], [11], [12], [13]].Phase change materials (PCMs) that can absorb or release a lot of heat during phase transition while keeping its temperature constant are the core of latent heat storage

technology.

Phase change materials (PCMs) are latent heat storage materials, having ability to absorb thermal energy from phase change asphalt (binder, mastic, motar or mixture) via phase transition ...

In addition, latent heat storage has the capacity to store heat of fusion at a constant or near-constant temperature that corresponds to the phase transition temperature of the phase change material (PCM). Latent heat storage is based on the heat absorption or release when a storage material undergoes a phase transformation from solid to solid ...

Although the large latent heat of pure PCMs enables the storage of thermal energy, the cooling capacity and storage efficiency are limited by the relatively low thermal conductivity (~1 W/(m ? K)) when compared to metals (~100 W/(m ? K)). 8, 9 To achieve both high energy density and cooling capacity, PCMs having both high latent heat and high thermal ...

Over the last decade, the development of thermal energy storage techniques effectively promotes the utilization of renewable and clean energy and alleviates the environmental pollution caused by fossil energy combustion [1], [2], [3], [4].Among the various heat storage techniques, latent heat thermal energy storage (LHTES) has attracted extensive ...

Phase change materials (PCM) achieve temperature regulation by absorbing heat or releasing heat during phase change. PCM has the function of controlling temperature distribution (Meng et al., 2019; Jin et al., 2019) recent years, a large number of scholars have studied the temperature regulation behavior of asphalt pavements using phase change energy ...

Latent heat storage systems use the reversible enthalpy change Dh pc of a material (the phase change material = PCM) that undergoes a phase change to store or release energy. Fundamental to latent heat storage is the high energy density near the phase change temperature t pc of the storage material. This makes PCM systems an attractive solution for ...

Studies that applied latent heat storage technology to asphalt pavements have been conducted to mitigate the urban heat island effect [14,15] or melt snow [16]. Solid-liquid PCMs such as paraffin [16], polyethylene glycol [17,18], fatty acids [19], etc. are often used in asphalt pavement due to their high latent heat, small volume change during ...

Latent heat storage is to use the phase change of materials to store thermal energy, and differs from sensible heat storage that uses the specific heat of materials [18]. The phase change latent heat characteristic of the PCM can collect and store solar energy when the temperature is higher than the phase change temperature.

The solid-state heat pumping [] is one of the primary objectives of the recent research on phase change

materials (PCMs).The switching of heat flow by means of external potential field is termed "active caloric effect." Among various PCMs in solids, shape memory alloy (SMA), which makes use of the latent heat associated with the stress-induced martensitic ...

Generally, latent heat of fusion and high thermal conductivity is a trade-off problem since the volume fraction of PCM decreases when the thermal enhancer is added. Enhancement of the latent heat of fusion and thermal conductivity are discussed in Section 5 Improvement of latent heat of fusion, 6 Heat transfer enhancement of PCMs, respectively.

Phase change material (PCM) is a latent heat fusion material that releases/absorbs latent heat during the melting/crystallization process [14]. At the melting temperature (solid-liquid transition ...

Add to Mendeley. Share. ... as the isocyanate and the molar ratio of MDI and polyethylene glycol (PEG) being 5, due to its desirable latent heat storage capacity of 93.5 J·g -1 and phase change temperatures of 36-48.3 °C, excellent thermal stability and reliability, and its strong ability to withstand harsh conditions of asphalt pavements ...

The areas of the heat flow curves during the crystallization of the four MPCM-modified asphalts are 4.64 J/g, 6.01 J/g, 9.35 J/g, and 11.62 J/g. Obviously, the latent heat of the MPCM decreases severely when added to asphalt. This phenomenon occurs because asphalt does not provide heat (its heat flow curve has no crystallization peak).

The preceding findings show that CCPCM cannot only play the role of heat storage but also improve the rutting and fatigue properties of asphalt mastic. ... and D. James. 2018. "Performance analysis of incorporating phase change materials in asphalt concrete pavements." ... Y. F., P. S. Liu, J. C. Wang, H. C. Dan, H. Wu, and Y. T. Li. 2020b ...

After adding PCMs into asphalt mixture, the low-temperature crack resistance of asphalt mixture improved, but the indirect tensile strength decreased. ... Synthesis and characterization of PEG/ZSM-5 composite phase change materials for latent heat storage. Renew. Energy, 121 (2018), pp. 45-52, 10.1016/j.renene.2017.12.089.

Reflecting coating refers to the coating on the surface of asphalt pavement consisting of functional coating material. It can reflect solar radiation in the visible (0.4-0.7 µm) and near infrared band (0.7-2.5 µm), and the absorbed heat energy will be reflected to the outer space in the form of long wave (2.5-15 µm), which suppress the coating surface temperature ...

Phase change materials, Latent heat storage, Thermophysical properties, Heat transfer intensification methods: ... The methods for enhancing thermal conductivity of PCMs, which include adding additives with high thermal conductivity and encapsulating phase change materials were reviewed. Addition of thermal conductivity enhancement fillers is a ...

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The application of the phase change materials in asphalt mixtures must meet the conditions for a suitable phase change temperature, large latent heat, and stabil-ity. Among various PCMs, ...

Latent heat storage systems involving phase change materials (PCMs) are becoming more and more attractive for space heating and cooling in buildings, solar applications, off-peak energy storage ...

A paraffin/expansive graphite composite phase change material was prepared by adding expanded graphite with good thermal ... preparation and application of phase change heat storage materials in the temperature range ... the temperature rise of the composite phase change material tends to be gentle and is in the process of latent heat storage ...

In latent energy storage, the heat that is absorbed is released after a material"s physical state changes. Therefore, the increased specific heat capacity of a pavement could influence the heat impact by preventing temperatures from rising during the day and by increasing temperatures during the night. ... adding to night-time light pollution ...

Compared with other thermal energy storage materials, the use of hexadecane has numerous benefits such as its phase transition temperature (18 °C) close to room temperature and its important latent heat (224 J/g) [9]. Nevertheless, the low heat transfer values and the liquid leakage on the phase change process limits its use in thermal energy ...

It is found that phase change materials (PCMs), as environmentally friendly materials, can spontaneously store and release heat energy by changing the phase state, thus ...

Phase change material (PCM), also named as latent thermal energy storage material, is capable of storing and releasing large amounts of thermal energy [7].During the phase change process, PCM can regulate mismatch of energy demand by absorbing or releasing heat [8].Nowadays, PCM has been used in many applications such as exploiting solar energy, ...

Phase change materials are frequently used in thermal storage systems due to their large latent heat und isothermal nature. This paper discusses different phase change materials. Techniques for improving their thermophysical properties are highlighted. Their corrosive effects on the stability of construction materials are approached. Finally, different applications, in which the ...

Thermal energy storage can be categorized into different forms, including sensible heat energy storage, latent heat energy storage, thermochemical energy storage, and combinations thereof [[5], [6], [7]].Among them, latent heat storage utilizing phase change materials (PCMs) offers advantages such as high energy storage density, a wide range of ...

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Thermal energy storage (TES) techniques are classified into thermochemical energy storage, sensible heat storage, and latent heat storage (LHS). [1 - 3] Comparatively, LHS using phase change materials (PCMs) is considered a better option because it can reversibly store and release large quantities of thermal energy from the surrounding ...

Phase change materials (PCMs) are latent heat storage materials that absorb or release heat under almost isothermal conditions. In terms of adjusting or regulating temperature, PCMs ...