

JH Solar

Sodium sulfate decahydrate energy storage



Overview

Heating and cooling systems in building infrastructure utilize conventional materials that account for a considerable amount of energy usage and waste. Phase change material (PCM) is considered a promisi.

Is sodium sulfate decahydrate a phase change energy storage material?

In this paper, sodium sulfate decahydrate (SSD) with a phase transition temperature of 32 °C was selected as the phase change energy storage material. However, SSD has the problems of large degree of supercooling, obvious phase stratification, and low thermal conductivity.

Is sodium sulfate a good salt hydrate?

For example, sodium sulfate decahydrate, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ (SSD), has been identified as one of the most promising salt hydrates for building applications due to its low cost (1.60 \$/kWh), high energy storage capacity (254 J/g), and moderate melting temperature (32.4 °C) [20, 21].

Which graphite is used in the manufacture of sulfate decahydrate (SSD)?

Sodium sulfate decahydrate (SSD) salt hydrate, dextran sulfate sodium (DSS) polyelectrolyte, and sodium tetraborate decahydrate ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$, Borax) were purchased from Sigma-Aldrich, expanded graphite (GRAFOIL, TG-855A) and jet milled expanded graphite (GRAFOIL, TG-679) were supplied by NeoGraf Solutions, LLC.

What are the advantages of polyelectrolyte-stabilized salt hydrate phase change material (PCM)?

Polyelectrolyte-stabilized salt hydrate phase change material (PCM). Reduced phase separation of sodium sulfate decahydrate upon thermal cycling. Significant increase in thermal cycling stability up to 100 thermal cycles. PCM composite exhibited 290% increase in energy storage capacity. High throughput processing technique.

What is the melting enthalpy of inorganic hydrated salt?

Their phase transition temperature is between 8 and 117 °C, and their melting enthalpy is about 116–377 J g⁻¹ [5]. Inorganic hydrated salt phase change energy storage materials are widely used because of their broad application range, low price, and large latent heat of phase change. In most cases, inorganic hydrated salts are neutral.

Can dextran sulfate sodium reduce phase segregation?

In this work, a novel strategy was developed and validated to reduce the phase segregation of SSD by using a water soluble, negatively charged polysaccharide, dextran sulfate sodium (DSS), as an anionic polyelectrolyte additive.

Sodium sulfate decahydrate energy storage



Experimental and application study of Na₂SO₄·10H₂O with

In recent years, sodium sulfate decahydrate (Na₂SO₄·10H₂O) has gained increasing attention as one of the most typical materials for phase change energy storage due ...

THERMAL ENERGY STORAGE USING SODIUM SULFATE DECAHYDRATE ...

Author (s): Biswas, Dipak R. If you recently published or updated this item, please wait up to 30 minutes for the PDF to appear here.



Research progress of sodium sulfate decahydrate phase ...

Caimei YU, Xuelai ZHANG, Weisan HUA. Research progress of sodium sulfate decahydrate phase changematerial [J]. Energy Storage Science and Technology, 2021, 10 (3): 1016-1024.



Sodium sulfate decahydrate

This study addresses the stabilization methods for low-cost phase change materials, including sodium sulfate decahydrate, for use in thermal energy storage. It highlights the material's ...



Thermal properties of graphite/salt hydrate phase change material

Thermal energy storage (TES) systems using phase change materials (PCMs) are of increasing interest for more efficient energy utilization. Herein, sodium sulfate ...



Nanoscale Stabilization Mechanism of Sodium ...

Sodium sulfate decahydrate (SSD) is a low-cost phase-change material (PCM) for thermal energy storage applications that offers substantial melting enthalpy and a suitable temperature range for near ...



Sodium sulfate decahydrate phase change energy storage

...

The invention discloses sodium sulfate decahydrate phase change energy storage material compositions. The compositions mainly comprises sodium sulfate decahydrate, a nucleating ...



Thermal energy storage using sodium sulfate decahydrate and ...

Sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) is known to decompose peritetically upon heating to 32.4 C to yield anhydrous sodium sulfate and a saturated solution of Na_2SO_4 in water. ...



2MW / 5MWh
Customizable

Thermal energy storage using sodium sulfate decahydrate and ...

It appears that the major problem preventing use of sodium sulfate decahydrate for thermal energy storage can be avoided by using the composition which is at or slightly to the water-rich ...

Thermal energy storage in salt hydrates

This article reviews the material aspects of thermal energy storage in salt hydrates. In air circulating systems that separate the collection and storage of solar heat (the ...



Thermodynamics of crystallization of sodium sulfate decahydrate ...

Sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$), also known as mirabilite or Glauber's salt, has been the most investigated salt hydrate for use in latent thermal energy ...

Fast UV curing sodium sulfate decahydrate based flexible phase ...

Sodium sulfate decahydrate (SSD) is a common solid-liquid inorganic PCM with a high latent heat value (around 230 J/g) and a phase change temperature of around 36 °C ...



??,Applied Energy ...

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Composite hydrate salt Na₂HPO₄ · 12H₂O - Na₂SO₄ · 10H₂O ...

The results show that the phase separation phenomenon is eliminated in the composite material with a mass ratio of 9:1 for disodium hydrogen phosphate ...



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????? (sodium sulfate decahydrate,SSD)??????????
 (2.4 ?)?????????? (??200
 J/g)????????????????????,??????????? ...

Thermal Design and Analysis on Energy Storage Systems ...

re of sodium sulfate decahydrate also remains constant during the phase change which is useful for keeping the subject at uniform temperature. In the present paper, we are considering a ...



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???: ????, ??, ?????, ????, ???? Abstract: A new formulation for the preparation of phase change cold storage materials based on sodium sulfate decahydrate (SSD) was proposed for air-conditioning ...

Stabilization of low-cost phase change materials for thermal energy

Sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, SSD), a low-cost phase change material (PCM), can store thermal energy. However, phase separation and unstable ...



Solar Thermal Energy Storage Systems

Sodium sulfate decahydrate releases its water of crystallization to form anhydrous sodium sulfate at 32°C , an ideal temperature for low grade solar heating applications. [8] A small house (740 sq. ft.) in Boston was ...

(PDF) Thermodynamics of crystallization of sodium ...

Keywords: Pitzer's model; Supersaturated solutions; Sodium sulfate decahydrate; Crystallization; Heat storage; Calorimetry Nomenclature exp. experimental ΔE G excess Gibbs energy of an electrolyte aw activity of ...



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?: ????? (sodium sulfate decahydrate,SSD)????????? (2.4 ?)????????? (??200 J/g)????????????????,????????????????? ? ,????????? ...

Stabilization of low-cost phase change materials ...

Sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, SSD), a low-cost phase change material (PCM), can store thermal energy. However, phase separation and unstable energy storage capacity (ESC) limit its use.



Microencapsulation of sodium sulfate decahydrate composite

...

energy storage solar house using sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) as a PCM. Since the 1970s, the theoretical understanding and utilization of heat storage technology have ...

Stabilization of low-cost phase change materials for thermal energy

Sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, SSD), a low-cost phase change material (PCM), can store thermal energy. However, phase separation and unstable ...



Preparation and properties of sodium sulfate decahydrate shape

For the problem of easy leakage, the method of packaging and shaping [13] can be adopted. Borax (PB), as an effective nucleating agent, can provide nucleation sites for the ...

Stabilizing a low temperature phase change material based on ...

The aim of this research is to enhance the performance of Glauber's salt (sodium sulfate decahydrate, SSD) as a phase change material (PCM) for thermal energy ...



Study on performance optimization of sodium sulfate decahydrate ...

In this paper, sodium sulfate decahydrate (SSD) with a phase transition temperature of 32 °C was selected as the phase change energy storage material. However, ...

Energy and exergy analysis of a solar dryer integrated with sodium

Abstract Energy and exergy-based performances of a natural-convective solar dryer (NCSDR) integrated with sodium sulfate decahydrate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) and sodium ...



$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ dehydration in view of thermal storage

Thermodynamics of crystallization of sodium sulfate decahydrate in $\text{H}_2\text{O} - \text{NaCl} - \text{Na}_2\text{SO}_4$: application to $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ -based latent heat storage materials

Inorganic Salt Hydrate for Thermal Energy Storage ...

Using phase change materials (PCMs) for thermal energy storage has always been a hot topic within the research community due to their excellent performance on energy conservation such as energy efficiency in ...



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Sodium sulfate decahydrate is a popular inorganic hydrated salt phase change material because of its suitable phase change temperature (32.4 °C), high latent heat of phase change value (>200 J/g), low price, wide source, ...

Study on performance optimization of sodium sulfate

...

In this paper, sodium sulfate decahydrate (SSD) with a phase transition temperature of 32 °C was selected as the phase change energy storage material. However, SSD has the problems of ...



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