Nanometallic high temperature solar container

Are nano-engineered coatings scalable?
Frontiers

Are solar absorber materials suitable for high-temperature operation?
One major barrier is the unavailabilityof suitable solar absorber materials for operation at higher temperatures. In this work,we report on a new high-temperature absorber material by combining Ti 2 AlC MAX phase material and iron-cobalt-chromite spinel coating/paint.

Can ceramic nanostructures improve solar thermal absorption?
Nanostructures are generally unstable above 850 °C in air,limiting their use in high-temperature solar thermal applications. Here,a scalable ceramic nano-architecture layer can significantly enhanceand stabilise the absorption of an arbitrary solar absorber.

Are nano-engineered coatings scalable?
However,most nano-engineered coatings and metasurfaces are not scalableto large surfaces (> 100 m 2) and are unstable at elevated temperatures (> 850 ° C),hindering their wide-spread adoption in CST. Here,we propose a scalable layer nano-architecture that can significantly enhance the solar absorption of an arbitrary material.

Are metal-based nanophotonic solar selective absorbers effective?
The authors demonstrate metal-based wafer-scale nanophotonic solar selective absorbers with excellent solar selective absorptivity and thermal stability,using a template (mold) stripping method which can drastically increase throughput and decrease fabrication cost.

How stable is a nanolayer at 900°C?
The nanolayer also exhibits excellent long-time optical stabilityat this ageing temperature i.e. solar absorptance of 97.88 ± 0.14% (temporal average ± standard deviation) between 100 and 1000 h of ageing at 900 ° C,with its effectiveness always exceeding 35%.

Can ZnO nanoparticles increase the energy storage capacity of Nano 3?
Enhancement of both the solid-phase and liquid-phase specific heat of NaNO 3 by the introduction of ZnO nanoparticles showed that the energy storage capacity of the phase change material increased. In other words,more energy can be stored for the same mass of the phase change material.

The optimized coating exhibits quite high solar absorptance (?s) of 0.930 at normal incidence and relatively low total emittances (?tot) within 0.093-0.240, achieving high solar-thermal ...

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Conventional steam sterilization for medical equipment requires electricity and significant initial capital cost, impeding its uses in many resource-constrained areas and exposing patients to nosocomial ...

Herein, to overcome the thermal diffusion of metal atoms in the QOM structure at high temperature, we proposed a spectrally selective solar absorber based on the QOM optical structure ...

This study reports the successful fabrication of Cu@Al2O3 macro-encapsulated metallic PCMs for high-temperature thermal storage over 1000 °C. Cu powde...

For instance, in practical engineering applications involving high-temperature latent thermal energy storage (LTES), the heat transfer fluid often operates at elevated temperatures, ...

However, metal has strong corrosion at high temperature, which requires very high corrosion resistance of container [7], and the leakage and corrosion of metallic PCMs such as Cu, Al ...

The CSP systems work at high temperature, and an efficient high-temperature thermal energy storage (TES) system is required to provide flexibility with grid electricity supply [4]. The solar ...

The high-temperature stability of solar absorber paints is critical for the efficiency of concentrating solar power systems, particularly central towers operating at ~800 °C, where ion ...

Phase change materials (PCMs) have excellent heat storage capacity and their phase transition temperature is close to constant, they have been widely used in the field of solar heat ...

It demonstrates the potential application value in the field of thermal energy absorption and storage, providing highly promising candidates for future high-temperature solar thermal ...

Applications like house space heating require low temperature TES below 50 °C, while applications like electrical power generation require high temperature TES systems above 175 °C [2]. ...

As a result, a slight temperature change can be used to store and release energy. These phase transition materials absorb thermal energy from the high temperature surroundings ...

To realize the high-temperature solar steam generation without the use of an optical concentrator, it is essential to design a highly efficient solar absorber for broadband solar absorption ...

Improving operating temperature is a straightforward way to increase the solar-electric efficiency of the concentrating solar power (CSP) through boosting the power cycle efficiency.

The operating parameters such as heat transfer fluid temperature, flow rate, and initial temperature of storage

material play a dominant role in PCM melting. The use of fins and ...

The storage system includes a finned container filled with nanomaterial (a blend of AlO nanoparticles and paraffin (RT30)), while the fluid circulating within the tube consists of a homogeneous mixture of ...

The design incorporates Y-shaped fins within the tilted tube to elevate the temperature of the water-based nanofluid, while tree-shaped fins are strategically placed inside the sinusoidal ...

Certain alloys at high temperature exhibit reactivity or solubility with many housing materials, for example molten aluminium will react with iron, steel and some ceramics to form several ...

This paper reviews a series of phase change materials, mainly inorganic salt compositions and metallic alloys, which could potentially be used as storage media in a high ...

This article reports a holistic approach to review different components and design aspects of high-temperature LHS with techno-economic challenges to be overcome. A preliminary ...

Consequently, this study presents a viable method for developing cost-effective silicon-based solar absorber coatings on stainless steel with tailored properties for solar thermal applications ...

Utilization of heat stores with high-temperature PCMs for the above-mentioned applications, as many researchers and experts believe, will allow raising considerably efficiency in ...

Concentrating solar power (CSP) plants, known as high-temperature (673-823 K) solar-thermal systems, have been widely installed for supplying power on-demand. The use of heat ...