



# Phenolic solar thermal absorber

Since the use of chemical fuels is permanently damaging the environment, the need for new energy sources is urgent for mankind. Given that solar energy is a clean and sustainable energy source, this study investigates and proposes a six-layer composite ultra-wideband high-efficiency solar absorber with an annular microstructure. It achieves this by ...

A GDY-based free-floating foam, with a multidimensional architecture that showed excellent solar energy absorption over the whole solar spectrum, and porous networks ...

Solar water purification is a promising technology with a strong potential for producing fresh water without effluent discharge. For energy-intensive interfacial vapor generation, energy loss to air via heat radiation and ...

Solar-thermal technology is a direct way to harvest solar energy for heating and energy storage applications 1,2,3,4,5. One implementation of solar-thermal technology, solar-driven evaporation ...

A loofah-based all-day-round solar evaporator with phenolic lignin as the light-absorbing material for a highly efficient photothermal conversion. Author links open overlay panel Yiying Yue a, Yu ... the evaporator enabled an all-day-round seawater desalination by releasing thermal energy stored in the polyethylene glycol loaded in the loofah ...

The as-prepared solar-to-thermal material prepared by coordinating  $\text{Fe}^{3+}$  with catechin showed wide optical absorbance and efficient conversion efficiency, and was stable under different ...

For solar ultrabroadband absorbers, there are two main mechanisms for absorption of incident solar radiation: (a) intrinsic absorption, including enhanced absorption of localized plasmon, nonradiative relaxation absorption and thermal vibration of molecules, (b) Interference-enhanced absorption, which mainly utilizes the interference of reflected light waves on different surfaces ...

A solar absorber, under the sun, is heated up by sunlight. In many applications, including solar cells and outdoor structures, the absorption of sunlight is intrinsic for either operational or aesthetic considerations, but the resulting heating is undesirable. Because a solar absorber by necessity faces the sky, it also naturally has

The interfacial solar evaporator based on the Ni/CNTs solar absorber effectively removed heavy metal ions and dye molecules from contaminated water and displayed stable ...

The semiconductors primarily used in solar-driven interfacial evaporation can be roughly divided into metal sulfides and metal oxides. While, metal oxides and metal sulfides have wider band gaps; for example,  $\text{WO}_3$  has a band gap of 3.4 eV [19]. For metal sulfides, insufficient hydrophilicity affecting the efficiency of water transportation, for instance,  $\text{MoS}_2$ -based solar ...



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It is known that solar absorbers can emit energy to the outside world by thermal radiation, so the efficiency of thermal radiation is also an important factor in evaluating the performance ...

Herein, we developed a metal-phenolic network ... fabricating low-cost, sustainable, high light absorption and anti-oil-fouling solar absorbers is needed for solar steam generation. As an abundant natural polymer, cellulose has been widely investigated and fabricated into hydrogel or foam with many promising features, such as low cost, robust ...

Solar selective absorbers (SSAs) possess high sunlight absorption (300-2500 nm) and low infrared thermal radiative losses (2.5-25  $\mu\text{m}$ ), which are undoubtedly the best choice for ...

The growing attention in solar energy has motivated the development of a highly efficient solar absorber. Under a certain light concentration, increasing the solar spectral absorption of solar absorbers can improve the photothermal conversion efficiency. In this paper, we first designed and prepared a single-layered cermet absorber based on the double-gradient ...

However, it is challenging to create a solar absorber that can absorb a high level of sunlight while maintaining low thermal radiation losses. As the solar absorber takes in more energy, its temperature increases, causing it to lose energy in the form of thermal radiation. The sweet spot of a solar absorber then, is that point when optimal ...

Download Citation | On Nov 1, 2023, Yiyang Yue and others published A loofah-based all-day-round solar evaporator with phenolic lignin as the light-absorbing material for a highly efficient ...

In this paper, we utilize Ti and InAs materials to design a device capable of perfect solar absorption and high thermal emission efficiency. This structure is capable of generating surface plasmon resonance (SPR) and cavity resonance (CR). As this structure produces different combinations of resonances in di

Analyzing the performance of a parabolic trough solar collector with advanced techniques adopted in the absorber- a review, Kasturi Bhattacharya, Sakshi Paradeshi, Mayur Karthik, Sakthiraja V R, B S Bibin, Gundabattini Edison

Here, we have developed coordination complexes between Fe<sup>3+</sup> and naturally occurring phenolic compounds as solar-to-thermal materials. The as-prepared solar-to-thermal material ...

As one of the most mature technology among solar thermal technologies, Concentrating Solar Power (CSP) has shown a great promise and is currently being deployed worldwide which could produce as much as 7% of the global electricity by 2030 and 25% by 2050 [2, 3]. Recently, new CSP projects in Australia and Dubai announced a record about low tariffs ...



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In recent years, solar water evaporation system by utilizing wood-based photothermal material has drawn a lot of attention and displayed promising practical application prospect. However, challenges still remain in terms of its relatively low efficiency. Here, a facile, cost-efficient, and scalable method was proposed to prepare porous silicon loaded wood ...

Metal-phenolic network coated cellulose foams for solar-driven clean water production ... high light absorption and anti-oil-fouling solar absorbers is needed for solar steam generation. As an abundant natural polymer, cellulose ... warranting the broadband light absorption ability for efficient solar evaporation. The thermal conductivities of ...

This paper deals with the lifetime estimation of black-pigmented polypropylene (PP) absorber grades for overheating protected solar thermal collector systems for hot water preparation in five ...

,? ...

The importance of thermal energy storage in solar collectors for efficiency and load balancing is highlighted., it discusses and list the potential alternative materials for the construction of ...

Wood-based solar steam generation devices (W-SSGDs) show great promise for desalination and wastewater treatment since they are cheap and sustainable. The fabrication of green, sustainable and efficient solar-to-thermal materials for use in W-SSGDs, however, remains a challenge. Here, we have developed coordination complexes between  $Fe^{3+}$  and naturally ...

The calculated  $E_a$ ,  $E_R$ , and  $\eta$  solar thermal of the fabricated SGM absorbers are close to those of ideal H<sub>2</sub> SGM absorber with a 30-nm graphene metamaterial layer [ $E_a/E_R$  ( $C = 1$ )]/? solar ...

As a new solar technology, interface steam generation has great prospects in the application of desalination and fractionation. Herein, we report a sustainable, efficient, and accessible loofah-based solar evaporator with a bilayer structure. The top carbonized layer functioned as efficient solar absorbers with broad light absorption and high light trapping. At the ...

Solar energy is a renewable energy source that can meet high energy demands without affecting mother earth. We have proposed a solar absorber design that has high absorption results for visible and infrared regions. Two different sizes metasurface resonator design is observed to find the best design for the solar absorber. The metasurface design with ...

We demonstrate radiative cooling of solar absorbers with utilization of sunlight. By placing a visibly-transparent thermal blackbody atop the absorber, we cool the absorber by  $13\text{ }^\circ\text{C}$ , while preserving or even slightly enhancing sunlight absorption.

Nevertheless, the remaining phenolic groups were still active and kept protecting the polymer from



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thermo-oxidative degradation. Consequently, the effective and true residual primary antioxidant concentration should be higher when accounting for the antioxidant molecules with remaining hindered phenolic groups [8].

... Summary and Conclusions ...

engineering and solar energy science offers a high potential for further developments in solar thermal technologies regarding costs, processing and collector design (Wallner and Lang, 2005; Lang et al., 2013). For polymeric solar thermal absorber materials a long-term stability in hot heat carrier fluid or hot air environment is of prime ...

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