

Application of photothermal conversion solar container materials

<div class="df_qntext">What is photothermal energy conversion?

Photothermal energy conversion represents a cornerstone process in the renewable energy technologies domain, enabling the capture of solar irradiance and its subsequent transformation into thermal energy. This mechanism is paramount across many applications, facilitating the exploitation of solar energy for different purposes.

<div class="df_qntext">Can organic photothermal materials convert solar energy into thermal energy?

Organic photothermal materials can effectively convert solar energy into thermal energy in an environmentally friendly manner and have great potential for applications such as desalination and thermoelectric power generation. However, some organic photothermal materials have low photothermal conversion efficiency.

<div class="df_qntext">What are the applications of photothermal conversion by nanomaterials?

Photothermal conversion by nanomaterials has also been employed in other physical (laser printing, photothermal manipulation), chemical (photothermal catalysis), and biological (PTT, drug delivery, bacterial inhibition) applications.

<div class="df_qntext">What are the advantages of photothermal conversion of solar energy?

Among all the solar energy conversion technologies, photothermal conversion of solar energy exhibits unique advantages when applied for water purification, desalination, high-temperature heterogeneous catalysis, anti-bacterial treatments, and deicing.

<div class="df_qntext">How important are photothermal materials in solar energy systems?

In photothermal conversion systems, photothermal materials are typically the most critical and indispensable component, playing a decisive role in the overall system efficiency. However, the poor light absorption ability of PCMs and most minerals hinders their application in solar energy systems.

<div class="df_qntext">How do photothermal materials store solar energy?

Under solar radiation, photothermal materials capture photons and convert light energy into heat, which raises the temperature of the PCM. Once the temperature exceeds the phase transition temperature, the PCM undergoes a phase change and stores thermal energy in the form of latent heat, thus achieving the storage of solar energy [63,64].

Carbon-based photothermal materials (CPTMs) can introduce temperature and salinity gradients in the SIVG process because of their outstanding photothermal conversion properties, ...

Research in the field has identified that the prerequisites of solar-driven seawater desalination are broadband-absorbing photothermal conversion materials[43] and desalination ...

This facile, scalable strategy offers a bioinspired route to solar-thermal materials with potential applications in water purification, steam generation, and thermal management. Graphical abstract A ...

This review aspires to enrich the understanding of photothermal materials within the framework of energy conversion, offering novel insights and fostering a more profound comprehension of their role ...

His research interests focus on the preparation of functional carbon-based materials, the controllable synthesis of inorganic nanomaterials, and their applications in energy conversion, ...

Heat transfer studies of different solar applications which operates on a variety of phase change materials shows that the performance improvement is fairly possible if the PCM is ...

Further perspectives are presented on the integration of photothermal catalytic technology into traditional chemical blocks, aiming at exploring efficient photothermal catalysts for ...

Additionally, EG endows the composites with photothermal conversion properties. Based on the excellent performances, applying the composites in greenhouses remarkably reduced ...

Photothermal conversion of solar energy, to produce hot fluid or hot air, takes place in solar collectors. Efficient conversion requires that a solar-absorbing surface is in thermal contact with the fluid or gas, ...

2.2. Photothermal Materials and Regulation Strategies Theoretically, the potential photothermal materials should have the following characteristics: (i) broad spectrum absorption, (ii) high ...

Photothermal conversion materials (PCMs) are crucial component in solar-thermal energy technologies. Although various PCMs with excellent sunlight harvesting have been developed ...

Enhancing the performance of solar energy evaporation and minimizing material degradation during application can be achieved through the design of novel photothermal materials. ...

The application of photothermal conversion technology in the fields of seawater desalination and wastewater treatment stands as a potent approach to alleviating the global water ...

Additionally, the review delves into the various evaluation methods for assessing the performance of photothermal PCMs. The applications of these materials cover a broad field from ...

Exploring low-cost, high-efficiency photothermal materials has an important significance in solar thermal utilization. In this work, a sewage sludge-derived biochar (SDBC) as an ...

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The use of plasmonic materials with extensive solar energy absorption, combined with their practical applications, provides new routes for realizing efficient photothermal conversion in ...

This paper reviewed the progress of the application and design strategy of two dimensional (2D) photothermal materials, such as graphene, MXene, and transition metal ...

Currently, there is great interest in the efficient collection and conversion of broad-spectrum sunlight through photo-thermal materials, and a variety of related application technologies ...

The use of carbon aerogels as photothermal materials in solar water evaporation, thermal energy storage, photothermal catalysis, photothermal therapy, and photothermal de-icing are ...

Aiming at the current research status in the field of SPCS, this review thoroughly examines the phase change materials and substrates in SPCS systems. It elucidates the design principles and methods of ...

Therefore, the development of photothermal materials with high efficiency of photothermal conversion or the improvement of solar water evaporation performance by designing ...

Synopsis Photothermal conversion has emerged as a method for applying high heat under irradiation. This outlook explores how it has been used in synthesis and its potential use in ...

Graphical abstract Strategies for the enhancement of photothermal conversion efficiency using the enhancement of sunlight absorption and reduction of heat loss are reviewed. The ...

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