

<div class="df\_qntext">What are photothermal conversions of solar energy?

Then, the state-of-the-art progress for photothermal conversions of solar energy is introduced in detail, mainly including photothermal water evaporation and desalination, photothermal catalysis, photothermal electric power generation, photothermal bacterial killing, photothermal sensors, and photothermal deicing.

<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 photothermal nanomaterials used for?

Within this context, photothermal nanomaterials have emerged as pivotal components in various applications, ranging from catalysis and sterilization to medical therapy, desalination, and electric power generation via the photothermal conversion effect.

<div class="df\_qntext">Can photothermal nanoreactors improve solar energy conversion?

With the deepening research on photothermal nanoreactors, their unique advantages are gradually being discovered. Photothermal nanoreactors integrate photothermal effects, pore confinement effects, and enhanced mass transfer effects, showing broad prospects in solar energy conversion.

<div class="df\_qntext">What are the different types of photothermal nanomaterials?

Different types of photothermal nanomaterials, including carbon-based nanomaterials (graphene oxide, CNTs), (811,814,815) MXene nanosheets, (813,816-818) metal nanoparticles, (810,819) and organic polymers, (820-822) have been successfully combined with phase-change materials to achieve high photothermal energy conversion efficiencies.

<div class="df\_qntext">Are photothermal nanomaterials powerful light-to-heat converters?

Herein we review the latest progresses on photothermal nanomaterials, with a focus on their underlying mechanisms as powerful light-to-heat converters. We present an extensive catalogue of nanostructured photothermal materials, including metallic/semiconductor structures, carbon materials, organic polymers, and two-dimensional materials.

Integrating plant-mediated synthesis with photothermal energy using solar or artificial light as a heating and reduction source represents a novel, dual-green approach that eliminates chemical reagents and ...

This review examines the critical role of multi-scale hierarchical structures, from molecular to macro levels, in optimizing light harvesting and photothermal efficiency in solar steam ...

The micro/nanostructured CNT/n-hydrogel exhibits extremely low reflectivity and greatly increases light trapping efficiency, and can be successfully applied for solar-to-electricity ...

Conversion and utilization of solar energy is one of the most important strategies being proposed to mitigate the foreshadowed global energy crisis and environmental issues. Amongst the ...

Additionally, new methods that capture indoor lighting help create energy-neutral buildings by going beyond traditional solar panels. By using different types of light, these buildings generate electricity ...

This makes SIE an ideal choice for water treatment applications. In the photothermal process of SIE, sunlight irradiation causes photothermal materials to absorb photons, resulting in ...

To address these challenges, photothermal conversion, a process where light energy is absorbed by materials and converted into heat energy, has emerged as a promising solution, ...

A photothermal process is a direct conversion of solar light, which can exhibit maximally achievable efficiency of energy conversion compared with other solar energy utilization technologies.

In this work, we demonstrate an inner-light-supply mode to accelerate the solar-thermal energy charging rate. As shown in Fig. 1 (right), the sunlight is concentrated by a concentrator...

Building on this idea, the Photothermal Solar Tunnel Radiator (PSTR) uses plasmonic nanomaterials to turn both direct sunlight and scattered light into heat efficiently. It fits smoothly with modern building ...

Biomass-based photothermal fabrics and superhydrophobic aerogel for self-floating solar evaporators with high energy efficiency in fresh water production from seawater Chen Zhang a, ...

Among those technologies, solar-enabled seawater evaporation has drawn much interest, because it just uses inexhaustible solar energy to generate vapor via photothermal ...

Highly efficient solar steam generation (SSG) relies on excellent light absorption, adequate water transportation, a large evaporation area, and high thermal management capability in coherent ...

Therefore, it is highly urgent to develop new renewable energy sources and explore programs to improve catalytic efficiency [13]. As a renewable energy source, solar energy attracts ...

It is pivotal to improving the photothermal catalytic conversion by exploring efficient photothermal catalysts with intense broadband solar energy absorption and high efficiency of solar-to ...



# Nano-photothermal solar container light energy

The photothermal confinement effect arising from Co nanoparticles" solar-thermal conversion capability, coupled with the antireflective and passivation functionalities of Al<sub>2</sub>O<sub>3</sub>, ...

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