

How can thermal management improve photothermal conversion systems?

Thermal Management Effective thermal management is essential in enhancing the efficiency of photothermal conversion systems, which convert solar energy into thermal energy. Here, we discuss strategies to improve thermal management by focusing on insulation, heat transfer mechanisms, and materials selection.

How do photothermal materials optimize solar energy utilization?

To optimize solar energy utilization, photothermal materials are engineered to maximize incident solar radiation absorption, while minimizing losses due to transmission and reflection. Furthermore, these materials are designed to convert absorbed photon energy into thermal energy efficiently.

Can organic photothermal materials be used in SIE systems?

Additionally, organic photothermal materials exhibit superior biocompatibility and biodegradability [19,20]. From the perspectives of material stability and environmental sustainability, organic photothermal materials hold significant potential for applications in SIE systems.

What are solar-driven photothermal materials?

Solar-driven photothermal materials are promising platforms for addressing global energy challenges and environmental issues. Solar energy mainly focuses on the wavelength range from 300 to 2500 nm (Figure 3a), which occupies over 98% of solar energy.

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.

Are photothermal materials interdisciplinary?

Notably, within the interdisciplinary landscape of Materials Science Multidisciplinary, photothermal materials have carved out a substantial niche, accounting for 25.69% of the research focus, as illustrated in Figure 1 A.

In this review, we comprehensively summarized the state-of-the-art photothermal applications for solar energy conversion, including photo-thermal water evaporation and ...

There, photothermal materials efficiently transform solar radiation into thermal energy, which can be directly utilized for heating or converted into electrical energy via ...

mankind. The conversion of solar energy into other forms of energy has attracted extensive research interest due to climate change and the energy crisis. Among all the solar energy conversion technologies, photothermal

conversion of solar energy exhibits unique advantages when applied for water purification, desalina-

Currently, energy depletion and environmental pollution pose serious threats to the sustainable development of human society [1], [2]. Harnessing solar energy through photocatalysis to convert it into clean ...

The photothermal properties of metal nitrides have recently received significant attention owing to diverse applications in solar energy conversion, photothermal therapies, photoreactions, and ...

Figure 2 was adapted with permission of The Royal Society of Chemistry from [23] ("Solar absorber material and system designs for photothermal water vaporization towards clean water and energy ...

The Department of Energy (DOE) began operations in 1977, which directed the USA's Solar Energy Technologies Program (SETP) through its Office of Solar Energy Technologies (Clark, 2018). The "Public Utility Regulatory Policy Act of 1978" provided tax credits for residents who invested in solar energy in an attempt to initiate a small niche PV ...

Photothermal catalysis realizes the synergistic effect of solar energy and thermochemistry, which also has the potential to improve the reaction rate and optimize the selectivity. In this review, the research progress of photothermal catalytic removal of volatile organic compounds (VOCs) by nano-catalysts in recent years is systematically reviewed.

Photothermal CO₂ methanation is crucial for carbon neutralization and long-term space exploration, but the reliance on sunlight irradiation limits its practical application. Herein, a fluorite two-dimensional ...

Solar energy is an abundant and clean source of energy available to us [1], as the amount of solar energy that hits the Earth in one day is equivalent to the total electricity generated by the world's power plants for 250 years. This is much faster than the rate at which human civilization produces and uses energy [2]. Although this resource is essentially limitless [3], ...

Boosting Low-Temperature Resistance of Energy Storage Devices by Photothermal Conversion Effects ACS Appl Mater Interfaces. 2022 May 10 ... Changchun Institute of Optics, Fine Mechanics and Physics, Chinese ... The present work may provide new insights on the application of solar energy and the design of energy storage devices with excellent ...

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