

Nano-photothermal energy storage light 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.

What are the applications of photothermal nanomaterials?

Besides the above-discussed applications, photothermal nanomaterials can also be potentially applied in sensing, wearable devices, energy storage and conversion, as well as photothermal electrodes. In this section, several representative examples of these applications will be presented.

What is a functionalized photothermal nanomaterial?

Through further integration with other molecules or particles, the functionalized photothermal nanomaterials with synergistic properties can perform multiple tasks for targeted applications, including light manipulation, catalysis, and therapy, with the assistance of thermal energy.

Why is photothermal energy conversion important in sub-Nanometric Materials?

Sub-nanometric materials (SNMs) are an attractive scope in recent years due to their atomic-level size and unique properties. Among various performances of SNMs, photothermal energy conversion is one of the most important ones because it can efficiently utilize the light energy.

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.

Why is photothermal energy conversion important?

Among various performances of SNMs, photothermal energy conversion is one of the most important ones because it can efficiently utilize the light energy. Herein, the SNMs with photothermal energy conversion behaviors and their applications are reviewed.

When exposed to light radiation, PPy molecules can utilize the transition of electrons in molecular orbitals to absorb light energy, and then convert the absorbed light energy into thermal energy, exhibiting a ...

The results also indicate that the utilized nanoparticles exhibit a higher attenuation to light, and the scattering effect cannot be avoided, where the maximum scattering proportion is 6.3%. ...

1 INTRODUCTION. Renewable, abundant, and clean solar energy is expected to replace fossil fuels and alleviate the energy crisis. However, intermittency and instability are the deficiencies of solar energy due to its ...

Photothermal energy conversion is an important method to utilize light energy. In this field, photothermal materials first absorb the light energy, and then convert it into heat energy for further use. According to the ...

6 ???· The ability to convert, store and utilize solar energy forms the corner-stone for driving the paradigm shift in the energy transition for sustainable development [1], [2]. While ...

Nano-Micro Lett. (2024) 16:276 Received: 22 March 2024 ... this study covers various light-induced photothermal and photochemical processes ranging from melting, crystallization, and ...

In this review, we comprehensively summarized the state-of-the-art photothermal applications for solar energy conversion, including photothermal water evaporation and desalination, photothermal catalysis for H₂ generation ...

The capability of photothermal nanomaterials to enhance light absorption, convert heat, and conduct thermal energy is highly dependent on the material choice and structural design. In this section, we will summarize the ...

As the implementation of PCM into building components increases the thermal storage capacity of buildings [[11], [12], [13]] and the accumulation of the energy storage and ...

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