

Are sulfur vacancy-engineered metal sulfide photocatalysts suitable for solar energy conversion?

The vital roles of sulfur vacancy in promoting charge separation and inhibiting photocorrosion are summarized. Finally, the development prospects and opportunities of sulfur-vacancy-engineered metal sulfide photocatalysts for solar energy conversion are proposed.

Can sulfur be used for solar energy?

To reach their objectives, project partners have tapped into the potential of sulfur for thermochemically storing solar energy and generating carbon-free round-the-clock electricity. This concept was combined with an innovative centrifugal receiver that can heat bauxite particles to 900 °C by concentrated solar energy.

How can solar energy be converted into thermal energy?

Apart from the direct pathway of solar energy to chemical energy, solar energy can also be transformed to thermal energy through the photothermal effect, and thereby promoting the catalytic reactions. The photothermal effect has three different mechanisms: nonradiative relaxation, thermal vibration, and plasmonic heating.

Can solar energy be stored in sulfur?

The technology was tested at the Jülich Solar Power Tower of the German Aerospace Center. The key concept behind storing solar energy in sulfur relies on sulfur combustion. The innovative process developed by the project team involves a number of steps.

Is solar energy a viable energy source?

By virtue of its abundance and sustainability, solar energy has been recognized as the most promising energy source, and it will play the most important role in the energy-source structure of the future. In 1972, Fujishima and Honda first reported that TiO<sub>2</sub> can be used as a photoelectrode for water splitting.

What is the second most prominent process for solar organic synthesis?

The second most prominent process for solar organic synthesis is endoperoxide formation. Artemisinin, a class of semisynthetic polycyclic endoperoxides, have been on the frontline of antimalarial therapy for the last decades.

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Sulfur-based photocatalysts (e.g., CdS, ZnIn<sub>2</sub>S<sub>4</sub>, ZnS) are widely used in photocatalytic organic conversion due to their suitable energy band levels, excellent visible light response, and superior charge mobility.

The recently demonstrated potential of centrifugal particle receivers to provide hot particle streams of temperatures above 950°C as heat transfer fluid and solar energy storage material in the form of sensible heat opens new possibilities in performing endothermic chemical reactions that take place below this temperature in solar ...

These developments suggest that elemental semiconductors may represent a new class of photocatalysts for solar energy conversion. The finding that elemental sulfur can act as a semiconductor photocatalyst increased interest in it, and this is emerging as an important element for developing novel materials for environmental ...

The conversion pathways of sulfur-containing substances in the process of coal oxidation was analysed. The oxidation activity order of different sulfur-containing groups during coal self-heating was investigated. Abstract. In order to reveal the evolution mechanism of organic sulfur in the process of coal spontaneous combustion, the reaction paths and thermodynamic ...

The conversion of solar energy into hydrogen fuel through PC or PEC water splitting and finally to chemical fuel through CO<sub>2</sub> reduction is a promising approach. Hydrogen, a clean and energy efficient fuel, has found myriad applications ranging from low-powered devices to the aviation sector. Throughout the existence of life on Earth, Mother Nature has nourished ...

In nature, nitrogen fixation is one of the most important life processes and occurs primarily in microbial organisms containing enzymes called nitrogenases. These complex proteins contain two distinct subunits with different active sites, with the primary N<sub>2</sub> binding site being a FeMoS core cluster ...

Enhancing the solar energy conversion efficiency of solution-deposited Bi<sub>2</sub>S<sub>3</sub> thin films by annealing in sulfur vapor at elevated temperature+. Zhehao Zhu<sup>a</sup>, Satish Kumar Iyemperumal<sup>b</sup>, Kateryna Kushnir<sup>c</sup>, Alexander D. Carl<sup>a</sup>, Lite Zhou<sup>d</sup>, Drew R. Brodeur<sup>a</sup>, Ronald L. Grimm<sup>a</sup>, Lyubov V. Titova<sup>c</sup>, N. Aaron Deskins<sup>b</sup> and Pratap M. Rao<sup>\*de</sup> <sup>a</sup>Department of Chemistry ...

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Several reviews have revolved around the use of solar energy and microbial hybrid systems for biocatalysis and CO<sub>2</sub> conversion. For instance, some reviews focused on the design and functional applications of materials in microbe-material hybrid systems, particularly on improving the efficiency and selectivity of biocatalytic reactions through solar-driven ...

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important not only for energy generation but also for the chemical industry, due to being essentially a cost-free and abundant power ...

Photocatalysts for solar energy conversion can be prepared using electrospinning, solid-phase methods, gas-phase methods, and liquid-phase methods. Most of the currently developed photocatalysts have poor quantum efficiencies and fail to utilize the visible ...

In addition to solar energy, electricity is integral to modern life, making the introduction of electricity into organic synthesis conversion strategies equally appealing. Electrocatalytic synthesis offers unique advantages, allowing control over chemical selectivity by adjusting various electrochemical factors, such as the applied voltage, electric current ...

The solid sulphur cycle process utilizes elemental sulphur as a thermochemical energy storage medium for concentrated solar thermal energy. The produced sulphur can be transported to a...

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