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The efficiency of photoelectrocatalytic (PEC) water splitting is limited by the serious recombination of photogenerated charges, high overpotential, and sluggish kinetics of surface reaction. Herein we describe the recent progress on engineering the electrode-electrolyte and semiconductor-cocatalyst interfaces with cocatalysts, electrolytes, and interfacial layers ...

Solar energy can supply the global energy demand. This Review describes how photoelectrochemistry principles in natural photosynthesis can be exploited in advanced solar utilization technologies ...

I am interested in working with designing highly efficient and stable semiconductor electrodes for photoelectrocatalytic (PEC) water splitting and CO<sub>2</sub> reduction for the production of solar fuels.

In recent years, green, clean, and renewable energy, represented by wind energy, solar energy, and water energy, has been widely studied, and these clean energies are generally converted into efficient, controllable, and simple other forms of energy for storage and transmission. 7, 8 However, due to the high volatility of solar energy and wind ...

The photoelectrochemical redox battery (PRB) has been regarded as an alternative candidate for large-scale solar energy capture, conversion, and storage as it combines the superior advantages of photoelectrochemical devices and redox batteries. As an emerging solar energy utilization technology, significant progress has been made towards ...

@article{Reddy2020NovelBN, title={Novel BiVO<sub>4</sub> nanostructures for environmental remediation, enhanced photoelectrocatalytic water oxidation and electrochemical energy storage performance}, author={Ch. Venkata Reddy and Itheerreddi Neelakanta Reddy and Ravindranadh Koutavarapu and Kakarla Raghava Reddy and Dongseob Kim and Jae-Jin ...

Photocatalytic reduction of CO<sub>2</sub> by using solar energy is emergent not only for environmental concerns but also production of suitable chemicals and fuels. Metal-organic ...

Renewable energy sources, such as solar and wind power, are taking up a growing portion of total energy consumption of human society. Owing to the intermittent and fluctuating power output of these energy sources, electrochemical energy storage and conversion technologies, such as rechargeable batteries, electrochemical capacitors, electrolyzers, and fuel cells, are playing ...

Energy is the key source for modern economic growth and social development. The increased industrial energy consumption and demand are global issues due to climate change [1, 2]. The renewable energy (RE) sources offer noticeable solutions towards reduced greenhouse gas (GHG) effects and alternative energy for the long-term economic ...

Nanoscale engineering of regular structured materials is immensely demanded in various scientific areas. In this work, vertically oriented TiO<sub>2</sub> nanotube arrays were grown by self-organizing electrochemical anodization. The effects of different fluoride ion concentrations (0.2 and 0.5 wt% NH<sub>4</sub>F) and different anodization times (2, 5, 10 and 20 h) on the morphology ...

Developing renewable energy and high-efficiency energy storage/conversion techniques are two urgent social issues since our earth suffers from huge threats of excessive energy exhaustion and increasing environmental pollution. ... Simultaneous photoelectrocatalytic water oxidation and oxygen reduction for solar electricity production in ...

The great versatility of semiconductor materials and the possibility of generation of electrons, holes, hydroxyl radicals, and/or superoxide radicals have increased the applicability of photoelectrocatalysis dramatically in the contemporary world. Photoelectrocatalysis takes advantage of the heterogeneous photocatalytic process by applying a biased potential on a ...

Synthetic tenability of metal organic frameworks renders them versatile platform for next-generation energy storage technologies. Here the authors provide an overview of selected MOF attributes ...

Driven by solar light, photoelectrocatalytic cells can convert CO<sub>2</sub> into energy carriers, but strategies to improve their performance are still required. Here the authors combine molecular and ...

The rising energy conflicts and environmental pollution are calling for the rapid development of advanced techniques such as photoelectrocatalysis to transform waste into energy and to clean contaminated media. Here we review photoelectrocatalysis for removing wastewater contaminants and recovering energy such as electricity and hydrogen (H<sub>2</sub>), with ...

Converting sunlight into fuels is attractive for energy storage and photoelectrocatalytic technologies. Scientific challenges related to developing suitable photoabsorbers, efficient catalysts and ...

This work studies the production of electricity by a photocatalytic fuel cell and its storage in a supercapacitor. We propose a simple construction, where a third electrode bearing activated carbon is added to the device to form a supercapacitor electrode in combination with the supporting electrolyte of the cell. The photocatalytic fuel cell is based on a CdS-sensitized ...

Photoelectrocatalytic hydrogen production is a sustainable energy technology that utilizes solar energy to

decompose water into hydrogen and oxygen. It offers the advantages of environmental protection and sustainability. However, its low efficiency in photoelectric water splitting results in relatively small hydrogen production, which severely limits its popularization in practical ...

The conversion of sunlight into fuels and chemicals is an attractive prospect for the storage of renewable energy, and photoelectrocatalytic technologies represent a pathway by which solar fuels ...

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With the escalating energy crisis and ever-growing demand for environmental protection, there is a huge surge in developing efficient and scalable strategies for synthesizing one-dimensional (1D) heterostructured nanomaterials due to their high versatility and applicability as essential components in nanoscale catalysis, chemical sensing, and energy conversion ...

Utilizing clean energy derived from photoelectrocatalytic reactions is expected to be an excellent choice to fundamentally solve the problem of the human energy crisis.

Phase effect of bismuth vanadate ( $\text{BiVO}_4$ ) nanostructured catalysts for the photoelectrochemical (PEC) solar water oxidation, removal of toxic organic pollutants from wastewater, and electrochemical ...

Powered by inexhaustible solar energy, photoelectrochemical (PEC) hydrogen/ammonia production and reduction of carbon dioxide to high added-value chemicals in eco-friendly and mild conditions provide a highly attractive ...

The design and preparation of bifunctional electrode materials play a vital role in the field of energy storage and conversion. Herein, Mo-doped  $\text{Ni}_3\text{S}_2$  nanosheet arrays assembled on nickel foam (named as Mo- $\text{Ni}_3\text{S}_2$ ) are designed through three-step continuous hydrothermal methods for enhanced hydrogen evolution reaction (HER) and supercapacitor ...

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Photoelectrocatalytic (PEC) water decomposition provides a promising method for converting solar energy into green hydrogen energy. Indeed, significant advances and improvements have been made in various fundamental aspects for cutting-edge applications, such as water splitting and hydrogen production. However, the fairly low PEC efficiency of ...

Supercapacitors (SCs), showing excellent power density, long service life, and high reversibility, have received great attention because of the increasing demand for energy storage devices. To further improve their performance, it is essential to develop advanced electrode materials.

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At present, the artificial methods for CO<sub>2</sub> conversion mainly include high-temperature catalytic hydrogenation, electrocatalytic reduction, photocatalytic conversion and photoelectrocatalytic methods [[8], [9], [10], [11]]. For the CO<sub>2</sub> reduction by high-temperature catalytic hydrogenation, the process must input high energy and hydrogen sources that is ...

Such studies are often related to energy renewal and energy storage [5 ... The photoelectrocatalytic degradation of rhodamine B (RB) using ITO/TiO<sub>2</sub>/dye as electrode was investigated via a series of potentials, from +1.0 to -1.0 V, and at various pH and NaCl concentration values (ITO is indium tin oxide conductive glass) ...

Hydrogen, a carbon-free source with a high energy storage density, and its generation through photoelectrochemical (PEC) water splitting using solar harvesting is the most attractive strategy to ...

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