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Abstract

Larisa Zolotova Solar-driven direct Z-scheme using hierarchical CdS/SiC heterostructure for enhanced photo catalytic water splitting

Mohsen Bayat
Master's Student, Department of Chemistry, Khajeh Nasir Toosi University of Technology (KNTU), Iran

Abstract:
Due to the increasing human need for energy, science is moving towards finding a sustainable and clean alternative to meet the world's energy needs; and among these, Photoelectrochemical and Photo catalytic Water Splitting is the best eco-friendly option!

To attain an acceptable performance from overall water splitting, a photocatalyst must have a suitable band structure with sufficient redox power, and also definitely must have high separation efficiency for photo generated charge carriers, and have a sufficient number of active sites. But there are few photocatalyst that have all of these basic properties; however, a suitable and easy solution to achieve the photo catalytic reaction of this is to use the direct Z- scheme structured from two semiconductor photocatalyst.

When CdS and SiC are in contact, the transfer of free CdS electrons to SiC begins immediately and continues until their Fermi levels are balanced. Therefore, in the interface of these two semiconductors, CdS will have a positive charge, and SiC will have a negative charge. Hence, an internal electric field is created and causes the band edge bending. After excitation by incoming light, both photocatalyst have the ability to create electron-hole pairs. The formation of this internal electric field forms a passage for the recombination of electrons photo generated in the CdS conduction band and holes photo generated in the SiC valance band, and a barrier to the transfer of photo generated electrons from the CdS CB to the SiC CB, as well as the barrier to the transfer of photo generated holes from SiC VB to CdS VB. Meanwhile, the electrons of the CdS CB and the holes of the SiC VB are conserved and spatially separated and can participate in specific photo catalytic reactions.

The photo catalytic performance direct Z-scheme photocatalyst depend on their morphology. Studies have shown that hierarchical structure photocatalyst have the best form; Large specific surface area, sufficient porous structure, more surface-active sites, and better mass transfer.

Biography:
Mohsen Bayat is a master's student in Analytical Chemistry

at the Khajeh Nasir Toosi University of Technology (KNTU: The Oldest Technical University in Iran). His main research interest and also master's thesis is in the fields of Photo electrochemistry, Photocatalyst, Semiconductors, and Nanotechnology. Therefore, his research focus is on integrating theory and experiment with the design and fabrication of photo electrodes for use in Photo catalytic and (Photo) electrochemical Water Splitting.

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