

Photocatalytic and Photoelectrocatalytic Hydrogen Generation through Water-Splitting Using Heterostructures

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The extensive use of fossil fuels is the main cause of rising global temperature, which leads to drastic climate change in recent years. This is because of CO₂ and other greenhouse gases emission during the consumption of fossil fuels. Moreover, the reservoirs for fossil fuels are rapidly decreasing. Thus it becomes imminent to explore renewable energy resources that are greener and sustainable. In this regard, hydrogen can play an important role. Hydrogen, a chemical fuel, can be used in fuel cells to generate electricity with water as the only byproduct. Hydrogen can be generated through water splitting reaction using sunlight. Both water and sunlight are abundantly available. However, for an efficient water splitting reaction, a suitable semiconductor material is necessary. The semiconductor should have an appropriate energy gap, band edges, high absorbance ability to create more number of electron-hole pairs, and keep them separated to participate in water-splitting to produce H₂. The electron-hole recombination is high with a single semiconductor, and therefore heterostructures with two different materials, either with metal/semiconductor or semiconductor/ semiconductor have shown improved performance. In this lecture, I shall discuss the importance of heterostructured nanomaterials for photocatalytic and photoelectrocatalytic water splitting to generate H₂.

References

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