Study on interfacial charge transfer between semiconductors in photocatalytic watersplitting

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Solar hydrogen energy using photocatalysts is promising in that it is clean and does not require additional energies. Unfortunately, most of the research in this field is limited to the half reaction which needs sacrificial agents. However, Z-scheme photocatalysts which consists of two photocatalysts, an oxygen evolving catalysts(OEC) and a hydrogen evolving catalysts(HEC), can achieve water-splitting even in pure water. Specifically, an electron and hole from OEC and HEC, respectively are recombined and the remainings are involved in water-splitting reaction. Thus, interfacial charge recombination is a key to high solar conversion efficiency.

Herein, BiVO4 and ZnxCd1-xS were synthesized as OEC and HEC, respectively. Overall water-splitting reaction was achieved by simply mixing the two catalysts under simulated solar light irradiation. The surfaces of the catalysts were modified in various ways such as the loading of metal, graphene oxide and so on. Such modifications could affect the ineterfacial carrier dynamics. Understanding the inter-particle carrier dynamics will shed light on the Z-scheme photocatalysts.