Photofunctional Catalysts for Solar Energy Utilization and Conversion

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Metal oxides such as TiO_2, WO_3, and Fe_2O_3 that consists of earth-abundant elements are the most practical base materials for solar energy utilization applications. Despite their popularity as solar conversion materials, breakthroughs in materials development have yet to be achieved for practical applications. A variety of approaches have been investigated to modify the base metal oxides using diverse inorganic and organic materials. The heterojunctions built at the interface of metal oxide reduce the charge recombination or enhance the interfacial charge transfer to achieve the higher conversion efficiency. In this talk, various modifications of metal oxides with interfacial heterojunctions will be introduced and discussed for photoelectrochemical and photocatalytic applications. The specific examples include dual-purpose photocatalysis for H2-recovering water treatment, water photooxidation, air purification, and the photosynthesis of H_2O_2.