Schottky barrier and surface plasmonic resonance phenomena towards the photocatalytic reaction: study of their mechanisms to enhance photocatalytic activity.

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Abstract

Metals are doped on semiconductors to enhance the activity of photocatalysts and two possible phenomena can happen at the interfaces of the semiconductors: Schottky barrier formation and Surface Plasmonic Resonance (SPR). Schottky barriers can improve the photoactivity of a reaction by trapping and prolonging the life of the electron. While SPR has the ability to create an electromagnetic field which can improve the photoreaction in three ways: photon scattering, Plasmon Resonance Energy Transfer (PRET) and hot electron excitation. Although both phenomena have been well grounded throughout the field, one crucial ambiguity is still found based on the proposed mechanisms, specifically, what is the direction of electron flow – from metal to semiconductor or vice versa? This feature article reviews the mechanism focusing on how Schottky barrier and SPR phenomena help to improve a photoreaction, as well as the paradox between the Schottky barrier and SPR in the matter of the direction of electron flow in the metal/ semiconductor system.

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