Improvement of Conversion Efficiencies of Photoenergy Conversion Devices Based on Plasmon Induced Charge Separation

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Metal nanostructures exhibit unique properties that are different from bulk metals.   One of the promising properties is localized surface plasmon resonance (LSPR), because light energy can be localized in nanospaces around the surface of the nanoparticle based on LSPR.   Furthermore, a plasmonic metal nanoparticle combined with a semiconductor exhibit plasmon induced charge separation (PICS).   When the resonant light irradiates to a plasmonic metal nanoparticle on an n-type semiconductor, electrons in the metal nanoparticle transfer to the semiconductor.   As a result, oxidative and reductive reactions occur on the surfaces of the metal nanoparticle and the semiconductor, respectively.

In this presentation, I report my recent approaches to realization of photoenergy conversion devices with high conversion efficiency by using PICS.