Metal/Semiconductor Nanostructure with Enhanced Plasmonic Photocatalytic Activity under Visible Light: Engineering of Plasmonic Near-Field Enhancement

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Surface plasmon resonance (SPR) effects have been widely used to construct photocatalysts which are active in the visible spectral region. For efficient plasmonic energy transfer from metal to semiconductor, we have to control local electric fields on the surface of nanoparticle. The electric fields which exist nearby semiconductor can enhance formation of electron/hole (e^-/h^+) pairs and the generated electrons can easily migrate to the surface. Therefore, we suggest gold/cuprite semi-shell nanostructures which are controlled the gap of nanoparticles for the regulation of local electric field. The local electric fields are maximized when the nanostructures have 10 nm gaps, and the hydrogen generation rate is also increased by more than 10 times. Our findings show a promising and straightforward way to design efficient photocatalysts.