Quenching of TiO2 photo catalysis by silver nanoparticles

The plasmon resonance of metal nanostructures affects neighboring semiconductors, quenching or enhancing optical transitions depending on various parameters. These plasmonic properties are currently investigated with respect to topics such as photovoltaics and optical detection and could also have important consequences for photocatalysis. Here the effect of silver nanoparticles of a size up to 30nm and at maximum 0.5 monolayers on the photocatalytic oxidation of ethylene on TiO2 is studied. Since the plasmon resonance energy of silver nanoparticles is comparable with the TiO2 band gap, dipole–dipole interaction converts excitons into heat at the silver nanoparticle. This indicates that plasmonic interaction with TiO2 semiconductor catalysts can reduce the photo catalytic activity considerably.