Visible Light Induced Degradation of Recalcitrant Pollutants Using Modified TiO_2 Photocatalysts

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Dye-sensitized TiO_2 and platinum ion-doped TiO_2 photocatalysts were synthesized and their physicochemical characteristics and visible light reactivities were investigated. When ruthenium complexes were used as a sensitizer of TiO_2, the visible light induced degradation of perchlorocompounds could be achieved through a reductive path. However, the sensitized TiO_2 is not stable enough to be a practical photocatalyst. In a related sensitized TiO_2 system, a simultaneous removal of dyes and heavy metal ions was observed in visible light illuminated TiO_2 suspensions and the removal rate of each component was synergistically enhanced. The electron injection from an excited dye into the conduction band of TiO_2 and the subsequent reduction of metal ions on TiO_2 take place concurrently to exhibit a novel synergic effect. This model system of ternary components (dye/ TiO_2/metal ion) can be a basis of solar remediation technology for dye-contaminated wastewaters. On the other hand, platinum ion doped TiO_2 as a visible light photocatalyst was synthesized and characterized to demonstrate its successful performance in degrading recalcitrant organic pollutants.