Photodegradation of Water Organic Contaminates Under Solar Simulator Light

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Abstract

Surfaces of Rutile TiO_2 particles have been modified with CdS nano-particles. The TiO_2/CdS system has been used as catalyst in water purification by photo-degrading organic contaminants such as methyl orange (a commonly encountered contaminant dye) and phenazopyridine (a medically active compound). Both UV and visible regions have been investigated. CdS sensitization of TiO_2 to visible region has been observed, as the TiO_2/CdS system showed higher catalytic efficiency than the naked TiO_2 system in the visible region. However, the TiO_2/CdS system was unstable under neutral, acidic conditions and basic conditions. Leaching out of CdS into hazardous aqueous Cd^{2+} ions occurred. This imposes limitations on future usage of CdS-sensitized TiO_2 photo-catalytic systems in water purification processes. In basic media, leaching out was less pronounced than in acidic media.

Alternative natural dye (anthocyanin) was used as a sensitizer for the rutile TiO_2 system. The TiO_2/anthocyanin catalyst was used in photo-degradation of MO and PhPY. Higher efficiency was noted when using AC/TiO_2/Anthocyanin at low pH in photo-degradation of MO.

ZnO-based catalyst systems, both naked and AC/ZnO were also examined. The ZnO systems were highly efficient in degrading contaminants, reaching complete removal in reasonable time, with AC/ZnO having a higher edge.

Effects of catalyst concentration, catalyst recovery, contaminant concentration, temperature and pH, on catalyst efficiency, have also been studied. Results and discussions will be presented.

Key words: TiO_2, ZnO, anthocyanin, photodegradation, solar light

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