Enhancement of visible light photocatalytic activity of ZnS and CdS nanoparticles based on organic and inorganic coating

ABSTRACT

Coating of ZnS and CdS nanoparticles with organic and inorganic materials can extend their light absorption in the visible region and their stability against photo-corrosion. Such materials could emerge as excellent photocatalysts for the elimination of pollutants from aqueous media using solar energy. In this study, PVP (polyvinyl pyrrolidone)-capped ZnS and CdS nanoparticles, ZnS/CdS and CdS/ZnS core shell nanoparticles were synthesized by microwave irradiation method and characterized using different techniques. The XRD patterns exhibited cubic and hexagonal structures for coated ZnS and CdS nanoparticles, respectively. Morphological evaluation of TEM images showed that the nanoparticles are generally spherical in shape. The UVï visible spectra confirmed a shift in the band gap of coated nanoparticles to longer or shorter wavelengths due to size and potential-well effects. The photocatalytic activity of nanoparticles toward dye degradation under visible light was found to be improved after coating. PVP-capped ZnS and CdS exhibited an enhancement in the initial methylene blue degradation efficiency by a factor of about 1.3. ZnS nanoparticles coated by CdS displayed the initial efficiency 3.2 times higher than bare ZnS. The maximum dye removal was obtained in presence of CdS/ZnS core shells which is 1.4 times more efficient than bare CdS.

Keyword: ZnS; CdS; PVP; Photocatalytic; Dye degradation; Visible light