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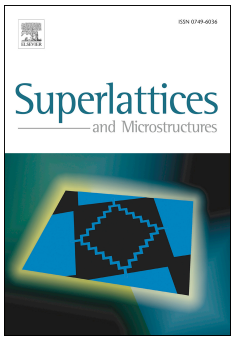

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Surfactant free synthesis of CdS nanospheres, microstructural analysis, chemical bonding, optical properties and photocatalytic activities

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Abstract

The surfactant free cadmium sulfide (CdS) nanospheres were synthesized by the chemical method in a single step. The uniform shape of CdS spheres was controlled by the variation of concentration of thioacetamide (C_2H_5NS). The cubic phase of CdS nanopowder was determined from XRD analysis, which closely matched to the standard card. The spherical grains of CdS powder were confirmed from the microstructural analysis. The concentration of thioacetamide (TAA) played a vital role in the formation of nanospheres. The bandgap of CdS nanospheres decreased from 2.44 to 2.22 eV as the mole concentration of C_2H_5NS increased from 0.05 M to 2.0 M. FTIR spectra confirmed the presence of the stretching bond of Cd-S. The dominant PL peak of purely and uniformed CdS nanospheres was observed at 528 nm due to S vacancies or surface defects. The prepared photocatalyst demonstrated the superior visible light photocatalytic degradation of methylene blue (MB). The highest degradation (96 %) of MB was achieved within 180 min. Therefore, CdS nanospheres grown in the single step by the chemical method has a remarkable enhancement in the degradation of pollutants under irradiation of visible light.

Keywords: Synthesis of CdS nanospheres, Microstructures, Structural and optical properties, Chemical bonding, Photocatalytic activity