Short Communication

Structural and Photoelectrochemical Studies of CdS Quantum Dots and Its Use as Photocatalyst for Methylene Blue Dye Degradation

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We report the influence of capping agents on the structural, photoelectrochemical and photocatalytic degradation of methylene blue (MB) dyes of monodispersed oleylamine (OLM) and octadecylamine (ODA) capped cadmium sulfide (CdS) quantum dots (QDs). Powder X-ray diffraction (pXRD) patterns of the as-prepared CdS QDs confirmed that QDs possess a hexagonal crystalline phase irrespective of the capping agents. TEM micrographs showed monodispersed spherically shaped CdS QDs with particle sizes of 3.16-5.68 and 4.71-5.61 nm for OLM-CdS and ODA-CdS QDs, respectively. The estimated band gap energy from Tauc plots were found to be 2.00 and 2.04 eV for OLM-CdS and ODA-CdS QDs, indicating that the as-prepared CdS QDs are quantum confined due to their small sizes and absorption band edges that are blue-shifted. Electrochemical band gaps were found to be 0.25 mV/s for OLM-CdS and 0.99 mV/s for ODA-CdS. The prepared CdS QDs were then used as photocatalysts for the degradation of MB dye and yielded a degradation efficiency of 65% for OLM-CdS and 76% for ODA-CdS QDs. This confirmed that the capping agent influences the photocatalytic degradation efficiency of the as-prepared CdS quantum dots.

Keywords: CdS, quantum dots, capping agents, photodegradation, methylene blue.

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