



Solar photocatalytic activity of indium sulfide nanocrystal and degradation of the tetracycline by In_2S_3

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ABSTRACT

Nanocrystalline $\beta\text{-In}_2\text{S}_3$ was prepared by reacting $\text{In}(\text{NO}_3)_3$ with thioacetamide through hydrothermal method at 120°C for 12 h. The size and morphology of In_2S_3 photocatalyst were characterized using X-ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscopy (TEM), and Brunauer–Emmett–Teller (BET) surface area analysis. The band gap energy was measured using Kubelka–Munk function and the electronic state of the prepared In_2S_3 was determined by X-ray photoelectron spectroscopy. The photocatalytic activity of the prepared sample was investigated by the photocatalytic degradation with 20 mg/L of the tetracycline (TC) under natural sunlight as a source of irradiation. The results showed that the synthesized In_2S_3 matches completely with the cubic phase of $\beta\text{-In}_2\text{S}_3$ with a surface area of $95.6726 \text{ m}^2 \text{ g}^{-1}$, and the photocatalytic activity for the degradation of TC under natural sunlight irradiation was excellent followed with first-order kinetics and the complete removal could be within 30 min, which suggests that the prepared photocatalyst has the potential to degrade the antibiotics.

Keywords: Hydrothermal method; $\beta\text{-In}_2\text{S}_3$; Heterogeneous photocatalyst; Tetracycline degradation; Natural sunlight

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