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Fabrication and characterization of novel iodine doped hollow and mesoporous hematite (Fe₂O₃) particles derived from sol-gel method and their photocatalytic performances

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Abstract

In this work, **iodine** (I) doped hollow and mesoporous Fe₂O₃ photocatalyst particles were fabricated **for the first time** through sol-gel method. Phase structure, surface morphology, particle size, specific surface area and optical band gap of the synthesized Fe₂O₃ photocatalysts were analyzed by X-ray diffraction (XRD), field emission scanning electron microscope (FESEM), X-ray photoelectron spectroscopy (XPS), BET surface analysis, particle size analyzer and UV–vis diffuse reflectance spectrum (UV–vis DRS), respectively. Also, **electrochemical properties and** photoluminescence spectra of Fe₂O₃ particles **were measured**. The results illustrated that high crystalline, hollow and mesoporous Fe₂O₃ particles **were** formed. The optical band gap values of the Fe₂O₃ photocatalysts **changed** between 2.104 and 1.93 eV. Photocatalytic efficiency of Fe₂O₃ photocatalysts were assessed **via** MB solution. The photocatalytic activity **results** exhibited that I doping enhanced the photocatalytic efficiency. 1% mole iodine doped (I-2) Fe₂O₃ photocatalyst had 97.723% photodegradation rate and $8.638 \times 10^{-2} \text{ min}^{-1}$ kinetic constant which **showed the highest** photocatalytic activity within 45 minutes. Moreover, stability and reusability experiments of Fe₂O₃ photocatalysts were **carried out**. The Fe₂O₃ photocatalysts showed outstanding stability after four sequence tests. As a result, I doped Fe₂O₃ is a good candidate for photocatalysts.

Keywords: Sol-gel; Hematite; **Mesoporous**; Iodine doping; Photocatalytic Activity.

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