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Photocatalytic degradation of reactive brilliant red X-3B over BiOI under visible light irradiation

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ABSTRACT

In this work, bismuth oxyiodide (BiOI) photocatalyst which is capable of responding to visible light was prepared and characterized by X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), and UV–vis diffuse reflectance spectroscopy (UV–vis DRS). Photocatalytic activity of this material was evaluated by using reactive brilliant red X-3B as a representative dye wastewater. It was found that BiOI had a strong visible light absorption, and the band gap energy was estimated to be 1.76 eV. This material exhibited good photocatalytic activity under visible light irradiation. For example, the removal efficiency of reactive brilliant red X-3B by BiOI was as high as 95% within 2-h visible light irradiation under the specific conditions: initial reactive brilliant red X-3B concentration of 10 mg L^{-1}, catalyst dosage of 2.0 g L^{-1}, and initial solution pH of 7. The photocatalytic degradation of reactive brilliant red X-3B by BiOI under visible light irradiation was found to follow the pseudo-second-order reaction. The results of the recycled experiments indicated that the photocatalytic activity kept stable in the photocatalysis. Furthermore, it was found that the degradation of methyl orange (MO) was also effective under visible light irradiation. From the viewpoint of energy efficiency and conservation, BiOI is an efficient visible light-responsive photocatalyst for the degradation of azo dye wastewaters.

Keywords: BiOI; Visible light; Dye wastewater; Photocatalyst; Kinetics

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