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Visible light responsive heterostructured α-Bi_2O_3/ZnO doped β-Bi_2O_3 photocatalyst for remediation of organic pollutants

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ABSTRACT

Novel visible-light active α-Bi_2O_3/ZnO doped β-Bi_2O_3 (ZB) photocatalyst was synthesized at different temperatures 400°C (ZB4), 500°C (ZB5), and 600°C (ZB6) by modified sol–gel method. The structural, morphological, compositional, and optical properties of synthesized photocatalyst were characterized using X-ray powder diffraction, field emission scanning electron microscopy, energy dispersive X-rays spectroscopy, Fourier transform infrared spectroscopy, and UV-vis spectroscopy. With an increase in calcination temperature, the bandgap of the prepared photocatalyst increases, and metastable β-phase Bi_2O_3 changes to α-phase. The photocatalytic activity was evaluated using Alizarin Red S (ARS) as a model organic compound. The rate of degradation was estimated from residual concentration spectrophotometrically. The results revealed that with an increase in calcination temperature, the photocatalytic activity of synthesized ZB photocatalyst decreases. Maximum decolorization efficiency (88%) was shown by the photocatalyst prepared at 400°C which is 29% and 37% higher than that of photocatalyst prepared at 500°C and 600°C, respectively.

Keywords: ZnO; Bi_2O_3; Photocatalyst; Alizarin Red S; Visible light

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