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Dahlia-shaped $\text{BiOCl}_x\text{I}_{1-x}$ Structures Prepared by a Facile Solid-state Method:

Evidence and Mechanism of Improved Photocatalytic Degradation of Rhodamine B

Dye

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Abstract

A rapid and cheap solid-state chemical process was employed to synthesize $\text{BiOCl}_x\text{I}_{1-x}$ ($x=1.0, 0.75, 0.5, 0.25, 0$) solid solutions with dahlia-shaped hierarchitectures. The dahlia-shaped $\text{BiOCl}_x\text{I}_{1-x}$ hierarchitectures were effectively constructed by nanoplates with a thickness about 5-13 nm. The band gap structure of the solid solutions can be modulated by adjusting the composition ratio of Cl and I, which has a significant effect on the photocatalytic activity of the solid solutions. The dahlia-shaped $\text{BiOCl}_x\text{I}_{1-x}$ ($x=0.75$) solid solution exhibits excellent adsorption and effective photocatalytic performances for rhodamine B (RhB) under visible light irradiation, which degraded more than 98% of RhB within 60 min under the visible light irradiation, it is higher than the reported bismuth oxyhalides materials. The trapping experiments confirmed that $\cdot\text{O}^{2-}$ and h^+ played the major role in the photocatalytic process and the possible photocatalytic reaction mechanism was illustrated.

Keywords: Solid-state reaction; Hierarchical structure; Bismuth compound; Photocatalysis.

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