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Preparation of Bi₃O₄Br/BiOCl composite via ion-etching method and its excellent photocatalytic activity

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Abstract: Bi₃O₄Br/BiOCl composite was synthesized using a facile ion-etching method with Bi₃O₄Br and HCl solution as precursors. Characterization results proved the formation of the binary system via controlling HCl amount. Photocatalytic test indicated that the synthesized Bi₃O₄Br/BiOCl composite has excellent photocatalytic activity in Rhodamine B degradation, mainly due to the enhanced separation efficiency of charge carriers. The optimal sample presents a degradation rate of 0.019 min⁻¹, which is 3.1 and 6.3 times higher than that of pure BiOCl and Bi₃O₄Br, respectively.

Keywords: photocatalysis; Bi₃O₄Br/BiOCl; solar energy materials; semiconductors; nanocomposites

1. Introduction

Removal of environmental contaminants using solar energy-driven photocatalysts has drawn increasing attention over the last few decades. Among the various semiconductor photocatalysts, BiOCl shows its specialty in degradation of dyes due to its unique layered crystal structure. The internal static electric field induced by the [Bi₂O₂] and double [Cl] layers endow BiOCl elevated separation efficiency of photogenerated electron-hole pairs [1]. Hence, BiOCl presents high photocatalytic activity and attracts scientists' attention. Till to now, many studies focused on BiOCl have been reported, which can be mainly summarized as using three different approaches (introduction of nano/micro structure [2], element doping [3], and heterostructured composite

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