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# Effect of the counter ions on composition and morphology of bismuth oxyhalides and their photocatalytic performance

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**ABSTRACT** It is generally believed that the replacement of cetyltrimethylammonium chloride (CTAC) with cetyltrimethylammonium bromide (CTAB) should result in the products with the same composition except for halogen ions difference, for example, from BiOCl to BiOBr. However, in this work, it has been demonstrated that CTAB as a bromine source led to the formation of $Bi_{12}O_{17}Br_2$ at room temperature, regardless of the reaction medium such as acetic acid (HOAc), urea or ethylene glycol (EG) solution, whereas, CTAC and KBr as a halogen source respectively led to BiOCl and BiOBr in the same medium. The $Bi_{12}O_{17}Br_2$ nanoparticles prepared in urea medium presented highly uniform hemispherical morphology, which endowed it with high specific surface areas and large pore volume. As a consequence, it exhibited superior photocatalytic activity for rhodamine (RhB) degradation under visible light irradiation. Moreover, the hemispherical $Bi_{12}O_{17}Br_2$ also revealed remarkable adsorptive ability for both the cationic dyes like RhB and crystal violet (CV) and anionic dye like methyl orange (MO).

*Keywords*: CTAB; Bismuth oxyhalide; Hemisphere; Photocatalysis

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