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Bismuth Oxyhalloys: enhanced photocatalytic performance of novel BiOXY (X, Y= Cl, Br, I) alloys.

Photocatalysis has always been a promising alternative in the remotion of pollutants from air and water, and even for clean energy production, such as hydrogen-based fuels. Nonetheless, there is not an ultimate photocatalyst with low recombination times, high quantum efficiency, chemical stability, non-toxicity and low cost. In order to face said drawbacks, bismuth-based materials, particularly bismuth oxyhalides (BiOX, X=Cl, Br, I), have demonstrated to be suitable for this application. Their photocatalytic behavior can be enhanced by a number of techniques, including, doping, morphological modulation, facet tailoring and, alloying. In this work, it is presented the enhanced photocatalytic activity of bismuth oxyhalide alloys (BiOXY, X, Y= Cl, Br, I) on the degradation of a reference contaminant (Rhodamine B 'RhB'). These materials were synthesized by a conventional hydrothermal reaction (160 ℃, 12 h, pH=2) using as reagents bismuth nitrate (Bi(NO3)3) and halogen salts (KCl, KBr, KI) in a stoichiometric ratio of 1:1. Characterization of the samples was performed by X-Ray diffraction (XRD), Diffuse Reflectance Spectroscopy (DRS), Volumetric Absorption of N2, and Scanning Electron Microscopy (SEM). The photocatalytic activity was measured by the diminution of the characteristic peaks of the absorption spectra of the contaminant as function of time. The obtained samples showed solid solution structures except for the Cl-I system due to difference between their ionic radii. The photocatalityc performance increased significantly in comparison to simple BiOX catalysts.

Keywords

Bismuth oxyhalides, photocatalysis, solid solution, alloying, catalyst.

Reference

R. Lu., A. H. Zahid, & Q. Han, Insight into the Photocatalytic Mechanism of the Optimal x Value in the BiOBr. Nanoscale 14(37). (2022). 13711-13721. https://doi.org/10.1039/D2NR03726B

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Author approval

I confirm

Author will attend

I confirm

Author: FLORES RAMÍREZ, DANIEL (UPIITA-IPN)

Co-authors: Ms ROBLES CORTÉS, Anel Ivonne (UPIITA-IPN); Prof. ROMERO-IBARRA, Issis Claudette (UPIITA-IPN)

Presenter: FLORES RAMÍREZ, DANIEL (UPIITA-IPN)

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