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WO_3/BiOBr heterojunction photocatalysts: Activity improvement and mechanistic study on selective oxidation of benzylamine

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Abstract

To improve the photocatalytic activity of materials, several approaches including metals/non-metals doping, introducing oxygen vacancy and forming heterojunction have been employed. In this work, we focused on enhancing the photocatalytic performance of bismuth oxybromide (BiOBr) for the oxidative coupling of benzylamine by forming heterojunction with WO_3. The reaction was carried out at room temperature under an O_2 flow using a white LED as a light source. BiOBr alone provided only 40% yield of *N*-benzylidenebenzylamine, however the yield increased to > 80% by coupling with WO_3. Mechanistic studies based on radical quenching experiment, EPR trapping study and Hammett plot were carried out to reveal a possible surface reaction mechanism in those heterostructure systems. Transient photocurrent and EIS were used to evaluate the electron-hole transfer and separation efficiencies of the materials. The insightful information on the structure-activity relationship and the involvement of reactive oxygen species in benzylamines transformation elucidated in this work lay an important background for the material design and encourage a further development of highly efficient photocatalysts toward organic fine chemical syntheses.

Keywords: *BiOBr; WO_3; Visible light; Heterojunction; Benzylamine*