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BiOI @MOF-235 heterostructures as an efficient visible light driven photocatalyst

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ABSTRACT

In this work, MOF-235, an Iron based metal organic framework (MOF) was incorporated with different molar ratios (0.1, 0.3, 0.5 and 0.7) of Bismuth Oxy Iodide to develop visible light active BiOI/MOF-235 photocatalyst. The MOF-235 was synthesized via facile microwave assisted route. The materials were characterized by XRD, FT-IR, FESEM, HRTEM, UV-vis DRS, BET and PL analysis. The photocatalytic activity of as prepared systems was investigated by degrading an azo dye, acid orange under visible-light irradiation. Among the as synthesized samples, the 0.7 BiOI/MOF-235 heterostructure system exhibited highest photocatalytic activity and improved stability compared to others for the degradation of acid orange under visible light. The superior activity and improved stability of this heterostructured photocatalyst was attributed to the synergistic effects from two components of a heterostructure, for effective separation of electron-hole pairs. Radical-trapping experiments demonstrate that holes (h^+) and $^{\cdot-}O_2$ are primary reactive species involved in photocatalytic oxidation process. Moreover, the BiOI/MOF-235 photocatalyst did not show any obvious loss of photocatalytic activity during five cycle tests, which indicate that the heterostructured photocatalyst is highly stable and can be used repeatedly. Therefore, the work provides new insights into the design and fabrication of Metal-organic frameworks (MOFs) for use as a visible light photocatalyst for degrading organic contaminants.

Keywords: Acid orange, azo dye, BiOI/MOF-235, Heterostructures, MOF-235, radical trapping.