Our group is interested in the preparation technology of photoelectric and environment functional materials and the related basic performance. Applied researches mainly focus on solar hydrogen production from water splitting and photocatalytic environmental purification. In this work, we develop novel nanomaterials for highly-efficient photocatalysis under visible light irradiation and study the related basic performance and their application. Specific as follows: (I) The photocatalytic functional materials utilized to the rapid, efficient and deep pollutants purification and catalytic properties are discussed. (II) The adsorption and degradation function in the environmental pollution (high concentrations of industrial waste water, environment toxic gas, liquid pollutants, indoor pollution gas and industrial waste gas) by inorganic materials and the related equipment researches are exploited.

**Photocatalytic Environmental Purification**

- XRD patterns of BiOBr and MoS_2/BiOBr composites with different mass ratios of [MoS_2]^{2-}.
- HRTEM image of MoS_2/BiOBr composite.

**Photocatalytic Oxidation using O_2**

\[ \Phi_0 / \Phi = 1 + K_{SV} [O_2] \]

\( K_{SV} \): Stern-Volmer constant
\([O_2] \): O_2 concentration

- Increase of photocatalytic activity with increasing **MLCT emission intensity**
- Low Emisson intensity: low
- High Emisson intensity: high

**Photocatalytic H_2 Production**

- Schematic representation of possible mechanism of MB decoloration using MoS_2/BiOBr composite.
- Photocatalytic efficiency of MB decolorization for pure BiOBr and MoS_2/BiOBr composites with different [MoS_2]^{2-} contents.
- Comparison of photocatalytic activities for the decolorization of RhB by 1 wt% Pt/TiO_2 and 5 wt% MoS_2/BiOBr under UV light irradiation and 5 wt% MoS_2/BiOBr composite and 1 wt% BiOBr/Pt composite under visible light irradiation.

This research mainly focused on the development of photoelectric materials activated by visible light and its application for photocatalytic hydrogen production.

**Acknowledgements:** Shanghai JiaoTong University, NSFC(Grant 51372151,21303103) and the Foundation of Shanghai Government (15PJ1404000)

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