Preparation of MoS₂ and MoO₃ Modified TiO₂ Composites with Enhanced Visible-light Photocatalytic Activity for Dye Degradation

Youfeng Zhang^{1,*}, Shasha He¹, Zelong He¹, Yichen Zhang¹, Yaping Feng¹,
Yinling Wang², Min Zhang^{3,*}

¹ School of Materials Engineering, Shanghai University of Engineering Science, Shanghai 201620, P. R. China

² Henan Engineering Laboratory of New Energy Conversion and Control Technology, Huanghuai University, Zhumadian Henan 463000, P. R. China

³ School of Chemistry and Chemical Engineering, Shanghai University of Engineering Science, Shanghai 201620, P. R. China

*E-mail: Zhangyoufeng@sues.edu.cn; zhangmin@sues.edu.cn

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TiO₂ is a widely used semiconductor photocatalyst for environmental governance and new energy applications. However, the development of TiO₂ has been hindered by its low utilisation of solar energy and poor quantum efficiency. In this work, a neoteric TiO₂@MoS₂ with a hollow structure and Au coating was designed. The composites showed good synergistic effects and improved visible-light utilisation for photocatalytic reactions. MoS₂ nanosheets were modified on TiO₂ microtubes to obtain TiO₂@MoS₂ composites with MoS₂ loading amounts of 29wt%, 32wt% and 50 wt%. The TiO₂@MoS₂ (32-wt%) showed a remarkable enhancements in photocatalytic dye degradation compared with TiO₂ microtubes. Au nanoparticles were successfully deposited on TiO₂@MoS₂-32% to achieve TiO₂@MoS₂@Au. The degradation rate of MB by TiO₂@MoS₂@Au was 1.80 and 1.46 times greater than those of TiO₂ and TiO₂@MoS₂-32%, respectively. Moreover, the adsorption rate of MB by TiO₂@MoS₂@Au was 7.86 and 1.16 times greater than those of TiO₂ and TiO₂@MoS₂-32%, respectively. This work provides a new process for improving the photocatalytic activity of TiO₂.

Keywords: TiO₂, MoS₂, Au, synergistic effect, visible photocatalysis

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