Visible-light-driven Pd doped β-Bi_2O_3 nanocomposite: an affordable and an efficient catalyst for mitigation of noxious pollutant

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Abstract

A series of surface plasmonic effect induced by Pd anchored β-Bi_2O_3 flower-shaped nanocomposite photocatalysts were prepared by the facile hydrothermal method. The crystallinity of the synthesized Pd loaded β-Bi_2O_3 nanocomposites is analyzed by powder X-ray diffraction analysis and the morphology and element presence of the synthesized Pd loaded β-Bi_2O_3 nanocomposites were characterized by field-emission scanning electron microscopy, transition electron microscopy and energy dispersive X-ray analysis. The optical properties of the synthesized Pd loaded β-Bi_2O_3 nanocomposites are analyzed by ultraviolet-visible diffuse reflection spectroscopy. The 2% Pd loaded β-Bi_2O_3 composite has higher photocatalytic activity in methylene blue degradation in visible irradiation than immaculate β-Bi_2O_3 and other Pd loaded β-Bi_2O_3 nanocomposites. The effect behind the improvement of photocatalytic activity of the 2% Pd loaded β-Bi_2O_3 composite is the surface plasmon resonance effect of Pd NPs and also interdependent bonding interaction between Pd and β-Bi_2O_3. Moreover, the radical trapping experiment substantiates that $^{\cdot}OH$ and $O_2^{\cdot-}$ play a vital role in MB abatements. The present work provides new deep insights into the intriguing other plasmonic photocatalytic materials with potential applications in the area of environmental indemnification.