Short Communication

Photocatalytic and electrochemical characteristics of BiFeO₃-TiO₂ nanoheterostructure for leather dyes degradation

Qiyan Wang¹, Baorong Duan^{1,*}, Yuzhen Zhao², Han Yu¹, Yonggen Weng¹, Tiantian Zhang¹

¹ Research Center for Leather and Protein of College of Chemistry & Chemical Engineering, Yantai University, Shandong Yantai, 264005, China

² Key Laboratory of Organic Polymer Photoelectric Materials, School of Sciences, Xijing University, Xi'an, 710123, China

*E-mail: duanbaorong@126.com

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The present work was focused on hydrothermal synthesis of the titanium oxide (TiO₂) nanorods and bismuth ferrite (BiFeO₃)-TiO₂ nanoheterostructure on indium tin oxide (ITO) as photocatalysts for photodegradation of leather dyes under visible-light irradiation. The samples were characterized via the SEM, XRD, EIS and UV-Vis absorption spectra. SEM results revealed that high density and high aspect ratio of BiFeO₃-TiO₂ were successfully grown on ITO substrate. XRD analysis exhibits that both the TiO₂ and BiFeO₃ phases coexist, which shows that there aren't any impurity phases at the interface between BiFeO₃ and TiO₂ with the synthesis condition. Optical characterization results revealed that BiFeO₃ nanoparticles leads to reduction the band-gap of TiO₂ nanorods which were calculated to be 2.93 and 2.58 eV for the TiO₂ and BiFeO₃/TiO₂ nanoheterostructure, respectively. EIS analysis shows that BiFeO₃/TiO₂ revealed lower recombination rate of electron-hole pairs which accelerate the photocatalytic reactions. The degradation efficiency for BiFeO₃/TiO₂ nanoheterostructure was 88% after 90 min under visible-light radiation which was significantly greater than its degradation efficiency (54%) in TiO₂ nanorods. These findings exhibited that the BiFeO₃/TiO₂ has the excellent visible-light harvesting performance for degradation of leather dyes.

Keywords: BiFeO₃/TiO₂ nanoheterostructure; Photocatalysts; Photodegradation of leather dyes; Optical and electrochemical properties

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