Journal of Environmental Chemical Engineering

Enhanced degradation of BPA in water by PANI supported Ag/TiO2 nanocomposite under UV and visible light

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Abstract

PANI supported Ag@TiO(sub)2 nanocomposite was synthesized via oxidative polymerization of aniline on Ag@TiO(sub)2. The Ag@TiO(sub)2 nanocomposite was synthesized by the photo reduction of Ag nanoparticles on hydrothermally synthesized TiO(sub)2 nanofibers. Raman analysis revealed that the anatase phase of TiO2 was synthesized showing typical peaks at 195 cm(sup)-1, 396 cm(sup)-1, 514 cm(sup)-1, and 637 cm(sup)-1. The incorporation of PANI, a carbonaceous material was confirmed by appearance of D-band and G-band in Ag@TiO(sub)2-PANI that were located at 1505 cm-1 and 1603 cm-1 respectively. X-ray diffraction (XRD) analysis confirmed the anatase phase of TiO(sub)2 was synthesized. Transmission electron microscopy analysis (TEM) analysis revealed that TiO(sub)2 nanofibers were synthesized successfully and Ag nanoparticles of different sizes were deposited on their surface. X-ray Photon Spectroscopy (XPS) survey scan of the Ag@TiO(sub)2-PANI-nanocomposite revealed that the nanocomposite was made from C, O, Ag, Ti, and N. DRS and Tauc`s plot estimated the band gap of Ag@TiO2-PANI to be 3.0 eV A comparative study of the photocatalytic performance of Ag@TiO2-PANI catalyst showed better degradation performance under both conditions than pristine TiO(sub)2, and Ag@TiO(sub)2 with a degradation of up to 99.7% under visible light irradiation. The degradation experiments showed that the reactive species that were dominant in the degradation of BPA were h(sup)+ and %O(sup)2-. Ag@TiO(sub)2-PANI nanocomposite was re-used to degrade BPA for up to four cycles without losing much of its photocatalytic ability with a removal of at least 90% in the fourth cycle.