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Fabrication of reusable magnetic multi-wall carbon nanotube-TiO_2 nanocomposite by electrostatic adsorption

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A simple, quick and efficient method for fabrication of magnetic multi-wall carbon nanotube-TiO_2 (MMWCNT-TiO_2) nanocomposite through electrostatic attraction was proposed as a novel method. First of all, TiO_2 nanoparticle was synthesized by atmospheric pressure chemical vapor synthesis (APCVS) method and characterized by Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD) and UV-vis diffuse reflectance spectra (DRS). The Magnetic Multi-Wall Carbon Nanotube (MMWCNT) composite was prepared. Finally, TiO_2 nanoparticle was coated onto the surface of the MMWCNT through electrostatic attraction in ethanol solution. The morphology and structure of the final composite were investigated by SEM, XRD, Energy dispersive X-Ray Spectrometry (EDS) and Fourier Transform Infrared Spectrophotometer (FT-IR). Both TiO_2 and MMWCNT-TiO_2 were characterized by BET surface area/pore volume analysis. The photocatalytic function of the TiO_2 and MMWCNT-TiO_2 composite was validated for Malachite Green (MG) degradation under irradiation of Ultra Violet (UV) light. MMWCNT-TiO_2, adsorbing MG, was easily separated from the aqueous solutions with the help of an external magnet; so, no filtration or centrifugation was necessary. The effects of pH, irradiation time, catalyst concentration, MG concentration, etc. on the photocatalytic activity were studied. The optimal conditions were an initial MG concentration of 20mg L^{-1} at pH 5.0 with catalyst concentration of 0.2g L^{-1} under UV irradiation for 240 min with good recyclization of MMWCNT-TiO_2 catalyst.

Biography

Ghazale Daneshvar Tarigh has received her PhD degree in Analytical Chemistry from University of Tehran, Iran in 2015. She has received her Bachelor's degree (BSc) in Pure Chemistry at the University of Zanjan in 2003 and Master's degree (MSc) under the direction of Prof. Yadollah Yamini at TMU and Prof. Ali Jabbari at KNTU in 2009. Her field of interest is the development of new extraction technologies with emphasis on miniaturized sample preparation methods and separation techniques.

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