Synthesis of TiO₂/polyacrylonitrile nanofibers composite and its application to lead ions removal from waste waters

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Abstract

The adsorption behavior of lead(II) from aqueous solutions utilizing TiO₂/polyacrylonitrile (PAN) nanofibers was studied. TiO₂/PAN nanofibers were prepared by electrospinning method and characterized by X-ray diffraction, Fourier transform infrared spectroscopy, thermogravimetric analysis (TGA), and scanning electron microscope. These data were utilized to show nanofibers and TiO₂ nanoparticles morphology and existence of TiO₂ in nanofibers web. The results show that the size of nanoparticles is about 70 nm and the fibers diameters is in the range of 1–2 μm. The changes in the parameters of adsorbent dosage, pH, contact time, TiO₂ concentration, and temperature were tested in the adsorption experiments. The adsorption was well described by the Langmuir adsorption isotherm model. The thermodynamic parameters indicate that the adsorption process is spontaneous and endothermic. The pseudo-first-order kinetic model describes the dynamic behavior for the adsorption of lead(II) ions onto PAN/TiO₂ nanofibers.

Keywords: Adsorption; Electrospinning; Polyacrylonitrile; Lead(II) ions; Nanofibers

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