Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2014.950991

56 (2015) 1403–1412
October

Taylor & Francis
Taylor & Francis Group

Synthesis of TiO_2/polyacrylonitrile nanofibers composite and its application to lead ions removal from waste waters

Maryam Shojaei[a], Sodeh Sadjadi[b,*], Mehdi Rajabi-Hamane[a], Seyed Javad Ahmadi[b]

[a]*School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran*
[b]*Nuclear Fuel Cycle School, Nuclear Science and Technology Research Institute, End of North Karegar Ave. Po. Box: 14399-51113, Tehran, Iran, email: sadjadi.s.s@gmail.com (S. Sadjadi)*

Received 13 January 2014; Accepted 8 July 2014

ABSTRACT

The adsorption behavior of lead(II) from aqueous solutions utilizing TiO_2/polyacrylonitrile (PAN) nanofibers was studied. TiO_2/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 TiO_2 nanoparticles morphology and existence of TiO_2 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, TiO_2 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/TiO_2 nanofibers.

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

*Corresponding author.