World Academy of Science, Engineering and Technology
International Journal of Nuclear and Quantum Engineering
Vol:10, No:05, 2016

Sorption of Cesium Ions from Aqueous Solutions by Magnetic Multi-Walled Carbon Nanotubes Functionalized with Zinc Hexacyanoferrate

Authors : H. H. Lee, D. Y. Kim, S. W. Lee, J. H. Kim, J. H. Kim, W. Z. Oh, S. J. Choi

Abstract : In recent years, carbon nanotubes (CNTs) have been widely employed as a sorbent for the removal of various metal ions from water due to their unique properties such as large surface area, light mass density, high porous and hollow structure, and strong interaction between the pollutant molecules and CNTs. To apply CNTs to the sorption of Cs+ from aqueous solutions, they must first be functionalized to increase their hydrophilicity and therefore, enhance their applicability to the sorption of polar and relatively low-molecular-weight species. The objective of this study is to investigate the preparation of magnetically separable multi-walled carbon nanotubes (MWCNTs-m) as a sorbents for the removal of Cs+ from aqueous solutions. The MWCNTs-m was prepared using pristine MWCNTs and iron precursor Fe(acac)3. For the selective removal of Cs+ from aqueous solutions, the MWCNTs-m was functionalized with zinc hexacyanoferrate (MWCNTs-m-ZnFC). The physicochemical properties of the synthesized sorbents were characterized with various techniques, including transmission electron microscopy (TEM), specific surface area analysis, Fourier transform-infrared (FT-IR) spectroscopy, and vibrating-sample magnetometer. The MWCNTs-m-ZnFC was found to be easily separated from aqueous solutions by using magnetic field. The MWCNTs-m-ZnFC exhibited a high capacity for sorbing Cs+ from aqueous solutions because of their strong affinity for Cs+ and specific surface area. The sorption ability of the MWCNTs-m-ZnFC for Cs+ was maintained even in the presence of co-existing ions (Na+). Considering these results, the CNT-m-ZnFCs have great potential for use as an effective sorbent for the selective removal of radioactive Cs+ ions from aqueous solutions.

Keywords : multi-walled carbon nanotubes, magnetic materials, cesium, zinc hexacyanoferrate, sorption
Conference Title : ICNST 2016 : International Conference on Nuclear Science and Technology
Conference Location : Tokyo, Japan
Conference Dates : May 26-27, 2016

Open Science Index, Nuclear and Quantum Engineering Vol:10, No:05, 2016 publications.waset.org/abstracts/50079.pdf