Comparison of cesium adsorption behavior of CHCF-PAN, MnO₂-PAN, STS-PAN, CM-PAN and AMP-PAN synthesized composites from aqueous solution

R. Saberi*, Y. Es-hagh, S. Azad, A. Rajabi

Nuclear Science and Technology Research Institute (NSTRI), PO Box 11365-8486, Tehran, Iran, Tel. +989121307069, email: rsaberi@aeoi.org.ir (R. Saberi), y.esgh@ce.iut.ac.ir (Y. Es-hagh), soheil.azad89@gmail.com (S. Azad), a.rajabi@mi.iut.ac.ir (A. Rajabi)

Received 18 September 2017; Accepted 28 February 2018

ABSTRACT

In this manuscript, five organic–inorganic composite ion exchangers (CHCF-PAN, MnO₂-PAN, STS-PAN, CM-PAN and AMP-PAN) were synthesized and efficiency of cesium adsorption from aqueous solutions was compared. The synthesized composites were characterized by various techniques including XRD, FT-IR, TGA, SEM, BET, XRF, CHN elemental analysis. In order to obtain the optimum conditions for the Cs⁺ adsorption, the influence of pH, contact time, temperature and presence of the interfering cations on the distribution coefficient of cesium onto composite sorbents were studied. Also, adsorption thermodynamic parameters were determined and it was observed that the adsorption of cesium on the adsorbent is an endothermic and spontaneous process. The Langmuir and Freundlich isotherm models were fitted to the obtained experimental sorption data. Also, the adsorption dynamic capacities of the synthesized composites in a fixed bed column were evaluated. Finally, it was concluded that synthesized AMP-PAN composite gave high efficiency of cesium removal from aqueous solutions, which was 67.77%.

Keywords: Synthesized composite sorbents; Ion exchange; Cesium adsorption; Fixed bed

*Corresponding author.