Effect of PAM coating on the magnetic nanoparticles structure based on different sodium salts for uranium removal from wastewater and study of pH effects on their adsorptions

Hadi Sarafraz, Mahmoud Jamshidian, Ghasem Alahyarizadeh*

Engineering Department, Shahid Beheshti University, G.C., P.O. Box 1983969411, Tehran, Iran

Received: 08.08.2017 Final revised: 05.07.2018 Accepted: 10.06.2018

Abstract

In this research, four different magnetic Fe_3O_4 nanoparticles were synthesized and characterized by solvothermal method based on different sodium salts. To study the effect of PAM coating on the uranium absorption, the synthesized magnetic Fe_3O_4 nanoparticles were coated with PAM (Fe_3O_4@PAM). The structural properties of the synthesized magnetic Fe_3O_4@PAM nanoparticles were examined by XRD, FT-IR and SEM. The XRD patterns indicated that the crystal structure of Fe_3O_4@PAM nanocomposites has maintained the same structure as the Fe_3O_4 nanoparticles which have a respectable agreement with other valid experiments. Likewise, The XRD and FT-IR results for Fe_3O_4@PAM nanoparticles showed that PAM coated on Fe_3O_4 successfully. The prepared Fe_3O_4 and Fe_3O_4@PAM nanoparticles were applied as sorbents to sorb uranium ions (U(VI)) from aqueous solution. In the adsorption test, the effect of pH was investigated. pH had a significant effect on the amount of adsorption. The adsorption results showed that the highest U(VI) adsorption of 197 mg/g at around the solution pH 10 was obtained for Fe_3O_4 nanoparticles which were synthesized based on Na_2CO_3; and 185 mg/g at around solution pH 8 to 9 for Fe_3O_4@PAM nanoparticles which was based on a mixed sodium source involved the Sodium acetate and Trisodium citrate.

Keywords: Magnetic Fe_3O_4 nanoparticle, Fe_3O_4@PAM, solvothermal synthesis, sodium salt sources, uranium adsorption

* Corresponding Author: g_alahyarizadeh.ac.ir