# Adsorption isotherms for the removal of Am-241 in radioactive liquid wastes using magnetite nanoparticles

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Americium-241 (Am-241) is a radionuclide with half-life of 432 years, emitting alpha particles and low gamma energy and it is also considered radiotoxic. Am-241 is produced, in a low level, from nuclear fuel and laboratory wastes. Magnetite nanoparticles ($Fe_3O_4$) are iron oxides that possess highly magnetic properties, and its application for removal of water contaminants refers due to its high surface area which allows the adsorption capability and the facility to be prepared and removed from the aqueous medium. In This study, magnetite was synthesized by co-precipitation method largely described. Batch experiments were accomplished at room temperature, at pH 6 and the contacts varying from 2.5, 5, 10, 20, 30, 40, 50, 60 minutes and at 30 minutes for the isotherms experiments. The solid containing magnetite and Am-241 were removed with a magnet and the solution analyzed in a gamma-ray spectrometer (Canberra Model GX2518) which could be quantified. Results show that magnetite possess a capability of removal up to 80% of Am-241 at room temperature, indicating that magnetite nanoparticles are a good sorbent for the removal of radionuclides. Langmuir and Freundlich Isotherms models were investigated and the parameters obtained. Langmuir's isotherm showed constants of $K_L$ (75.7575 L/mg), Q (0.1617 mg/g) and $R^2$ (0.9892) and Freundlich's isotherm exhibited values of $K_F$ (2.6416 [(mg/g).(L/mg)$^{1/n}$]), 1/n (0.7853 mg/g) and $R^2$ (0.8395), which indicates that the Am-241 removal from magnetite fits more suitable the Langmuir isotherm model. The thermodynamics parameters, such as the enthalpy and entropy of adsorption, the activation energy, as well as, the kinetics studies are under development.

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