



Lanthanides and heavy metals sorption on alginates as effective sorption materials

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ABSTRACT

This paper presents the possibility of using alginates as biosorbents for the removal of representative of the lanthanide group La(III) ions and heavy metals Cd(II) and Cu(II) ions from aqueous solutions. The calcium alginate in the form of beads obtained by the drop method was used. Biosorption was performed by the static method, studying the effects of pH, sorbent mass, phase contact time, initial solution concentration and temperature on the sorption process efficiency. The greatest removal performance was obtained for pH equal 5 and the sorbent mass equal 0.05 g. The maximum amounts of adsorbed metals were equal to 37.59 mg/g for La(III), 20.08 mg/g for Cd(II) and 15.09 mg/g for Cu(II). In order to determine the kinetic and isotherm parameters of the sorption process, the pseudo-first order, pseudo-second order, intra particle diffusion model kinetic equations as well as the Langmuir and Freundlich isotherms were used. Thermodynamic studies show that the sorption process is spontaneous and exothermic. The sorbent was characterized by attenuated total reflectance Fourier transform infrared spectroscopy, scanning electron microscopy and X-ray photo electron spectroscopy. Moreover, the point of zero charge was determined. The results pointed out that calcium alginate beads can find promising applications for removal and recovery of lanthanide's and heavy metals from aqueous effluents.

Keywords: Calcium alginate; Carboxyl group; Lanthanum; Heavy metals removal; Biosorption

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