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ADSORPTION CHARACTERISTICS OF ALGINATE COMPOUNDS FOR REMOVAL OF CERIUM IONS FROM AQUEOUS SOLUTION

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Abstract

Removal of the heavy metal ions from water disposals remains a widespread problem due to their adverse influence on public health. The most harmful materials are the products of nuclear fission called radioisotopes such as cerium ions. Cerium barely interacts with adsorbent materials, therefore the new substances capable to bind cerium are of great interest. Ca and Na alginate samples were incubated in Ce^{3+} solutions; adsorption capacity was measured and the results were evaluated using Langmuir and Freundlich equations and kinetics models. Ca and Na alginates possess Ce^{3+}-binding capacity which depends on the pH, contact time and metal concentration. It was found that equilibrium concentration is reached in 60 minutes of agitation period regardless initial Ce^{3+} concentration in the solution within pH range from 4.0 to 6.0. Ce^{3+} adsorption processes are best described by Langmuir equation, q_{max} for Ca alginate was found to be 158.73 mg/L and for Na alginate 204.08 mg/L. Na alginate was proved to be more effective as a cerium binding material. Kinetics of the Ce^{3+} adsorption by alginates was corresponding to the pseudo-second order equation. Ca and Na alginates may be considered as perspective compounds for the water treatment systems purposed for removal of radioactive materials such Ce^{3+} from the nuclear plant disposals.

Keywords: adsorption isotherm, alginate, cerium, equilibrium study, kinetics

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