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Sorption of selected radionuclides from liquid radioactive wastes by sorbents of the biological origin.

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Introduction
Radioactive waste-waters that contain radioactive metal ions, e.g. Cs(I), Sr(II), Co(II), and/or Am(III) are dangerous for people and for the environment. There are several methods to remove them from the wastewaters. A promising method of eliminating the radioactive metals from waste-water is sorption by low cost natural materials of the biological origin.
Among major advantages of sorption over conventional treatment are the high availability of the biosorbents, their low cost, and easy regeneration combined with the possibility of radionuclide re-usage [1,2].

Experimental
In presented studies, batch sorption of 137Cs(I), 85Sr(II), 60Co(II), and 241Am(III) on different natural materials of the biological origin (calcium alginate, powdered vegetables) was studied as a function of contact time, initial pH of aqueous solution and mass of the sorbent and concentration of the radionuclide, respectively. Potential sorbent materials have been characterized by different physicochemical methods.
An attempt to revitalize the metal-loaded sorbents was done by shaking the material at room temperature with different types of desorbing agents.

Results
Values of the Decontamination Factor (DF, i.e. ratio of the specific activity before and after decontamination [3]) have been determined and analyzed. They show that, in most cases, sorption on the studied natural materials of the biological origin may be used for the effective removal of radionuclides from aqueous solutions. Thermogravimetric analyzes of the materials show that sorbents studied in our laboratory decompose at relatively low temperatures. This means that the energy necessary to reduce the mass of the solid wastes obtained in the course of decontamination of liquid aqueous radioactive wastes may be relatively low, which decreases the cost of the process.
A novel procedure for the removal of the radioactive metals from aqueous wastes by the magnetic calcium alginate has been also proposed.
The studies were carried out as part of the Institute of Nuclear Chemistry and Technology statutory studies
References:
[1] G.M. Naja, B. Volesky (2009) Treatment of metal-bearing effluents: removal and recovery. Taylor & Francis and CRC Press, Boca Raton, FL;
[2] W.A. Ahmad, J. Jaapar, KMZ Mior Ahmad (2004) Removal of heavy metals from wastewater. In: A. Pandey (ed): Concise encyclopedia of bioresource technology. The Haworth Press Inc., New York, pp 152-157;
[3] http://www.euronuclear.org/info/encyclopedia/d/decontaminationfactor.html.

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