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Sorption on inorganic sorbents supported by ultrafiltration - hybrid method for treatment of radioactive liquid waste.

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Introduction

In accordance with the law in force, it is forbidden to dilute radioactively contaminated liquids and discharge them into the environment. Therefore, it is necessary to process them into a product that is safe for humans and the environment, with the aim to minimize their mass.

The choice of technology for purifying radionuclide-containing solutions depends on their composition, their specific activity, and the nature of the solvent. Combining two or more methods into hybrid processes, each of which can be applied to different concentration ranges or different components of the solution, can give good results.

Ultrafiltration (UF) is a widely used technique to remove hazardous pollutants from wastewaters [1]. The sorption-assisted ultrafiltration (SAUF) hybrid method combines the selectivity of sorption with the filtration ability of the membrane acting in synergy. Contrary to other membrane processes, ultrafiltration does not need high pressures to be applied.

Experimental

SAUF method was tested for removal of $^{137}\text{Cs(I)}$, $^{85}\text{Sr(II)}$, $^{60}\text{Co(II)}$, $^{241}\text{Am(III)}$ and $^{99\text{m}}\text{TcO}_4^-$ from aqueous solutions. A sample of modified aluminosilicate sorbent based on clay-salt slimes of JSC "Belaruskali" has been tested as a low-cost, eco-friendly sorbent. It has been already characterized and described [2,3].

Experiments with the solutions of different acidity were performed using a continuous-mode, cross-flow laboratory system equipped with a membrane with molecular weight cut-off (MWCO) equal to 10 kDa.

Metal concentrations in the initial and purified solutions were measured radiometrically.

Results

Decontamination Factors (DF) - the ratio of the specific activity of the solution before and after decontamination have been determined and analyzed. They show, that the SAUF technique is promising for the radionuclides effective removal from aqueous solutions.

Supplementary information: SAUF experiments were done within the IAEA Coordinated Research Project Management of Wastes Containing Long-lived Alpha Emitters: Characterization, Processing, and Storage (Project Code: T13017).

References:

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