

Revealing the dependencies of partitioning americium-241 and uranium using sorption technology based on solid-phase extractant TODGA

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The objective of this work is to reveal the dependences of the separation of americium-241 and uranium using sorption technology based on the solid-phase extractant TODGA. In technologies for the purification of radioactive waste of low and medium activity levels with low contents of actinides, sorption and ion exchange methods are widely used due to their high selectivity. The required selectivity level, under extreme external conditions of the environment, is inherent in solid-phase extractants obtained using ligands. To extract americium-241 efficiently and separate from uranium, it is necessary to use solid-phase extractants based on N, N, N', N' - tetraoctyldiglycolamide (TODGA), which will allow the return of fissile materials to the nuclear fuel cycle and reduce the hazard class of the removed radioactive waste. For the effective use of experimental modified TODGA sample, it is necessary to identify the dependences of the extraction of americium-241 and its separation with uranium using model solutions that simulate real radioactive waste. Therefore, the determination of the kinetic parameters of the extraction of americium-241 and its separation with uranium in the process of sorption processing using experimental modified TODGA samples is necessary for the most efficient separation process. In this work, the kinetic parameters and diffusion coefficients of americium-241 and uranium in the process of their sorption on experimental TODGA samples were determined. The kinetics of the process was investigated with the determination of the reaction rate, which was analyzed based on the dependence of the change in the concentration of the extracted element from the volume upon contact with the extractant on time, which depends on the value of the diffusion coefficient. The estimation of the reaction rate dependence on the value of the diffusion coefficients is carried out. Based on the dependence of the diffusion coefficients on the characteristics of the TODGA prototypes, the increased rate of sorption for americium-241 in comparison with uranium was determined by calculation. According to calculations of the diffusion coefficients of americium-241 and uranium in the experiments carried out with the samples under study, a prototype TODGA with the highest kinetic characteristics was determined.

Country/Int. organization

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