

SORPTION OF TECHNETIUM BY NEW CHELATING SORBENTS BASED ON FIBROUS MATERIAL FILLED WITH COMPLEXING GROUPS

I.B.Medvedeva, S.I.Rovny, N.A.Kuznetsova

Federal State Unitary Enterprise “Mayak” Production Assosiation, Russia

Chelating fibrous polymer sorbents of POLYORGS type posses selective properties regarding isolation of elements, for example, technetium. Chelating “filled” fibrous sorbents consists of porous hydrophilic fibre containing fine-grained polymeric fillers. These materials are sufficiently selective and exhibit high adsorptive capacity and fast kinetic.

Properties and analytical application of new complexing sorbents type POLYORGS 35 with hydrazidine groups and “filled” fibrous materials consists of porous sorbents AV-17 and AV-17, modified by reagent arsenazo-III, were considered. The advantages of these materials were demonstrated in the case Tc^{99} pre-concentration from water and water acid solutions. The sorption degree of technetium is 90-100 %. These materials can be used for the extraction of technetium from the solutions under static and dynamic conditions. Desorption of technetium by nitric acid was studied.

It was shown that for sorbent POLYORGS 35 distribution coefficients of technetium (for example K_d^{Tc}) increases along with decrease pH of water solutions. Sorption maximum is observed at $pH < 2$. For sorbents POLYORGS AV-17 and AV-17, modified by reagent arsenazo-III, distribution coefficients of technetium do not depend on water’s solutions pH (distribution coefficient is constant).

It was found that kinetic properties of sorbents are good, the equilibrium time in sorption varied from several minutes to 2 hour. However, kinetic properties of sorbent POLYORGS 35 were better then sorbent of POLYORGS AV-17 and AV-17 with arsenazo-III.

Sorption experiments were provided from model and real water solutions (I- model solution of sea water; II -solution of real water of lake Karachay; III – solution of drill hole waters of lake Karachay; IV – discharging waters of Production Assosiation “Mayak”). The ratio between the volume of the solution and sorbent mass was equal to $(V: m)=10^2$. The following sorption degree of technetium were obtained: for POLYORGS 35 from discharging waters (0,06 M HNO_3) – 98 %; for AV-17 and AV-17, modified with arsenazo-III, – 96 %.

The advantages of complexing sorbents of POLYORGS 35 type in comparison with another customary polymer adsorbents, for example, AV-17, consists in:

- 1) the possibility for selective sorption in the presence of macrocomponents (mainly alkali and alkaline-earth elements),
- 2) the high effective sorption and fast kinetic properties.

It was found that dependence of Tc sorption degree on ratio of the solution volume and sorbent mass for sorbents POLYORGS 35 decrease slower then for the sorbent of POLYORGS AV-17 and AV-17 with arsenazo-III.

Based on the results obtained we may conclude that studied sorbents can be used for the pre-concentration and isolation of technetium from water solutions and nitric acid solutions.