

# **APPLICATION OF FIBROUS "FILLED" SORBENTS TYPE POLYORGS FOR EXTRACTION OF TECHNETIUM (VII) FROM AQUEOUS MEDIA**

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Problems related with man caused radioactivity and its impact upon environment became global issue. As the result a new radioecology discipline was formed. Reprocessing of radioactive waste become one of the most important issues in this field as well as cleansing of natural waters from long lived radionuclides including  $^{99}\text{Tc}$ . Technetium-99 started to accumulate in Geosphere beginning from the fifties. The main sources of Tc income into environment were nuclear explosion fallout, wastes from nuclear fuel reprocessing plants and also atomic power plants dumps. Total annual accumulation of Tc in the world is about 6 tonns and up to 60 tonns were produced.

In practice for radioactive elements isolation from aqueous solutions sorption methods are often used [1]. Ion-exchangers and complexing sorbents - synthetic or natural polymers produced by chemical bonding of ligands and impregnation- are employed for the processes. It is known that strongly basic exchangers, such as for example AV-17 [2,3] and vinylpyridine sorbents like Dowex-1 and Reillev<sup>TM</sup>-HPQ [4], are the most perspective ion exchange resins for technetium isolation.

Complexing sorbents have higher selectivity towards individual ions which is determined by the nature of chemical active groups presented in polymer. Application of complexing sorbents in the form of fiber is the most perspective tendency for their employment. Fibrous complexing sorbents have greater advantages compare to granular ones because along with high selectivity for metal ions they have big surface which provides better kinetic properties. They are employed in analytical chemistry and in technology, for example, on the stages of rare and noble metals concentrating [5-7] as well as transuranium elements extraction from aqueous media [8,9].

Along with traditional fibrous sorbents obtained by modification of prepared matrices fibrous "filled" materials saturated by powder-like complexing sorbents are perspective sorbents as well. Unlike traditional fibrous sorbents they constitute of fine porous polyacrylonitrile filaments (diameter of 30-40  $\mu\text{m}$ ) and powder polymeric sorbent ("filler") which retained into fiber matrix. Distinctive features of such sorbents are good filter and fast

kinetic properties provided not only by fiber properties but also by small size of filler particles. Inorganic and organic ion-exchange resins can be used as filler as well as complexing sorbents and other sorption materials.

"Filled" fibrous sorbents produced usually as non-fabric are convenient in practice: sorption concentrating is easily performed in static or dynamic regimes and sorbents could be employed as discs placed on perforated surface or into special cell. Sorption could be performed in columns; for metal concentration from the big aqueous volumes a sorption cartridges also are perspective. However in the meantime there is no information in the literature about "filled" fibrous sorbents application for isolation and concentrating of such dangerous and long lived radionuclide and technetium.

In present work Technetium sorption was studied from acidic, neutral, and alkaline media by the fiber "filled" sorbents. Complexing sorbent POLYORGS, anion exchangers AV-17 and AN-31 were used as filler. Fiber "filled" sorbents were produced in city Tver` (Russia) by special technology and constitute of bonded material in the form of plates, degree of fiber filling was ~50%.

Table

**Isolation of Tc (VII) from aqueous media by fibrous "filled" sorbents.**

Solution volume 10 ml; sorbent mass 0,1 g; contact time 2 h.

Sorbent	Functional groups	Sorption degree, %		
		0,1 M HNO <sub>3</sub>	0,1 M NaNO <sub>3</sub>	0,1 M NaOH
AV-17	Quaternary ammonium groups	<b>92</b>	<b>91</b>	<b>91</b>
AN-31	Secondary and tertiary ammonium groups	<b>88</b>	<b>61</b>	<b>23</b>
POLYORGS-17	1,(3)5-dimethylpyrazole groups	<b>96</b>	<b>98</b>	<b>96</b>
POLYORGS-33	Amidoxime and hydrazidine groups	<b>67</b>	<b>20</b>	<b>6</b>
POLYORGS-35	Hydrazidine groups	<b>79</b>	<b>9</b>	<b>0</b>

The data for Technetium indicate amount isolation from different media by the sorbents mentioned above are given in the Table. Apparently AV-17 and POLYORGS-17 quantitatively isolates Tc from acidic as well as from neutral and alkaline media. Investigation of sorption degree as the function of time showed that sorption process is almost finished in 2 hours.

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