Cleaning the Ion Exchange Resin Sorption of Uranium from Silicic Acid Solution “Ayanat”

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Abstract: The authors discovered a new way to clean the ion exchange resin sorption of uranium from silicic acid used solution “Ayanat”. The method reduces the costs of regeneration of ion exchange resin and its reuse in the sorption of uranium.

Key words: Ion exchange resin, sorption of uranium, silicic acid, cleaning.

1. Introduction

Significant complications during the sorption of uranium from acidic solutions bring silicic acid. The content of silicic acid is often so great (as ASTM-967 content permitted SiO_2 2.5% in respect to uranium), that in solutions in a relatively short time may form gels which gradually depending on the acidity of the solution and the content of silica formed solid structure gel and occupy the entire volume of ion exchange resin.

One of the urgent problems in underground sulfuric acid leaching of uranium and its processing further is the formation of silicic acid and ion exchange resin is clogged and reducing the sorption of uranium [1-8].

To solve this problem, we have chosen a solution “Ayanat” to remove the silicic acid from the ion exchange resin.

2. Experiments

In a plastic bottle with a capacity of 500 mL was poured 25 mL of ion exchange resin having $\text{Si} = 11.793\%$ and $\text{U} = 55.680\%$, poured 100 mL of a 0.5% solution of “Ayanat” and stirred for 30 min at 25 °C. The purified ion exchange resin is dried to constant

weight and analyzed for silicon content. The Si content was 2.000%. Similarly, experiments were conducted with the regenerated ion exchange resin containing $\text{Si} = 7.492\%$, after purification by silica absent ($\text{Si} = 0\%$).

3. Results and Discussion

We carried out experiments on ion exchange resin purification of silicon solution “Ayanat” at different temperatures. It has been shown that increasing the temperature to 60 °C purification rate of the silicon resin is increased to 100%.

X-ray source and purified by ion exchange resin content of the residual quantities of uranium and silica are shown in Figs. 1-5 and in Table 1 at various conditions and temperatures.

As seen from the table, with increasing temperature up to 60 degree from the ion exchange resin purification silicic acid is 100%. This is due to the fact that as the temperature increases and increases the swelling of the resin solution “Ayanat” interact easily with the silicon by the reaction:

The result is the removal of silicon from the ion exchange resin.

Thus, our findings show that the solution “Ayanat” effectively clears the ion exchange resin from the

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Fig. 1 X-ray spectrum of the original saturated ion exchange resins.

Fig. 2 X-ray spectrum of ion exchange resin saturated after cleaning (25 °C).

Fig. 3 X-ray spectrum of the initial regenerated ion exchange resins (25 °C).

Fig. 4 X-ray spectrum of the regenerated ion exchange resin after purification (25 °C).

Fig. 5 X-ray spectrum of the regenerated ion exchange resin after purification (60 °C).

Table 1 X-ray source and purified by ion exchange resin.

No.		0.5% solution “Ayanat”, mL	Temperature, °C	Concentration U, %	Concentration Si, %	Degree of purification, %
1	Saturated resin (before cleaning)	-	25	55,680	11,793	-
2	Saturated resin (after cleaning)	100	25	33,588	2,009	82,96
3	Regenierated resin (before cleaning)	-	25	0,016	7,492	-
4	Regenerated resin (after cleaning)	100	25	0	1,076	85,63
5	Regenerated resin (after cleaning at 60 °C)	100	60	0	0	100,00

silicic acid. In the spring of 2015 it is planned to conduct pilot tests proyshlennye solution “Ayanat” to clean the ion exchange resin adsorption of uranium ions of silicic acid.

4. Conclusions

During the research, a new way to cleaning the ion

exchange resin sorption of uranium from silicic acid used solution “Ayanat”. The method reduces the costs of regeneration of ion exchange resin and its reuse in the sorption of uranium.

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