

TECHNETIUM BEHAVIOUR DURING SPENT FUEL REPROCESSING AT RT-1 PLANT

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The RT-1 solvent extraction process is of classic Purex-type with two uranium cycles and the plutonium/neptunium separation in their purification cycle. The incoming from fuel solution technetium is distributed among process streams according to its chemical and extraction behaviour. Until recent times, the efforts to complete the total balance of technetium distribution have not been successful due to the problems associated with the analysis of trace amounts of the element in process products. The represented results of the total technetium balance in Purex technology of RT-1 have been obtained using ICP MS.

The technetium distribution have been studied during reprocessing of VVER-440 fuel with medium burnup 34.5 GWd/tU and high burnup 47 GWd/tU. Fuel cooling before reprocessing was 6-7 years.

According to the total balance of all process products, the yield of technetium was 0.72 g/kg U at medium and 0.91 mg/kg U at high burnup. The technetium distribution by mixer-settler of highly active cycle is understood. Low value of the technetium yield in highly active aqueous raffinate have been obtained - 1-2%. The lack of technetium in condensate of evaporation system during evaporation of HA raffinate before its vitrification is good indirect evidence that this result is correct. The major part of technetium - 94-98% - is removed with raffinate of plutonium/neptunium purification cycle. Technetium does not volatilize during the processing of this raffinate by evaporation. Concentration of technetium in regenerate nitric acid was less than $0.3 \cdot 10^{-6}$ g/l.

The content of technetium in finishing uranium, plutonium and neptunium products, aqueous sodium carbonate raffinates of uranium and purification cycles have been obtained.

The highest decontamination factor of uranium from technetium is achieved at the first extraction cycle, whereas purification factor at the second uranium cycle was only about 10 to 15. The combined purification factor for two cycles stood at 2500 - 3500. Contrary to uranium product, purification factors for plutonium and neptunium from technetium are rather high - up to 10^5 .