# SEPARATION AND PURIFICATION OF 99Tc FROM SIMULATING HIGH-LEVEL RADIOACTIVE LIQUID WASTES

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A reversed-phase partition chromatography for separating technetium and ruthenium was described. Separation of fisson product 99Tc from simulating high-level radioactive liquid wastes with quaternary ammonium 7402 was realized. The method for technetium was very selective, and for ruthenium its decontamination power was high. The experimental results indicated that the 99Tc recovery rate was 90%, and the 103Ru decontamination factor was 1.0E+03. The ruthenium carrier was determinated with spectrophotometry. Apply this method, the excellent results were obtained.

The constituent of the simulated liquid show up to table 1.

Tab. 1. Constituent of the simulated liquid

| Ion | $Na^{+}$ | $Sr^{+2}$ | $Zr^{+4}$ | $Ba^{+2}$ | $Ce^{+3}$ | $Pr^{+3}$ | $Nd^{+3}$ |
|---|---|---|---|---|---|---|---|
| Concentration mol/m³ | 243 | 8.22 | 31.4 | 8.08 | 16.6 | 11 | 27.5 |
| Ion | $Fe^{+3}$ | $Mn^{+6}$ | $Cr^{+3}$ | $Ni^{+2}$ | $Ti^{+3}$ | $Mo^{+6}$ | |
| Concentration mol/m³ | 90 | 1.46 | 13.9 | 6.13 | 0.67 | 30.9 | |

Simulating liquid is adopted with formaldehyde solution (or formic acid solution) denitrated. After simulating liquid denitrated, it is added that ruthenium carrier and ammonium pertechnate solution, in case of PH equal 2, high-level radiative simulating liquid of mixture fission products have been made. In high-level simulating liquid, what with 99Tc carrier 1.62 mol/m³, and with Ru carrier 4.95 mol/m³.

In 25 ml separating funnel, add to the simulating liquid 10 ml, the quaternary ammonium 7402 100 mg, the samples extract neutralization 30 min. After lamination, absorption liquid 0.1 ml in the radioactive measurement plate on hygroscopic paper. Under infrared lamp dry, the samples radioactive activity was measured in beta measurement set. At last count the result.

The high-level radioactive simulating liquid run into extract chromatographic column contained the 400 mg quaternary ammonium 7402. Simulating liquid was passed extract chromatographic in the speed of 2.6 brace volume per hour, the samples run out liquid was collected in a time. When extract chromatographic column adsorpted saturation, the extract chromatographic column was held to the radioactive background level with distilled water. After a while, the extract chromatographic column was reversal-extracted with 8 mol/l nitrate acid solution

in the speed of 2.6 brace volume per hour. The reversal-extract liquid samples were collected in a time.

Whether adsorb extract liquid or absorb reversal-extract liquid. It was absorbed liquid 0.1 ml on the hygroscopic paper in the radioactive measurement plate (the reversal-extract liquid need to liquefact 100 time). Under infrared lamp dry, the samples radioactive activity was measured in the beta measurement set.

When high-level radioactive simulating liquid ran off extract chromatographic column, the samples was separated with distillation method. The ruthenium (IV) chlorine complex was prepared with direct oxidation method. The samples absorptivity was measured with 1 cm colormetric cell, the agent voidage made confer, while maximum absorb wavelenght of the complex is at 484 nm. The reversal-extract samples were determinated with direct oxidation method.

Different radioactive nuclides single was added into simulating liquid in the shap of nitration. The simulating liquid was agitated homogeneity. Radioactive count before decontamination was determinated. The simulating liquid comprised different radioactive nuclides was passed extraction and separation. The radioactive count was determinated again. As against before decontamination and after decontamination the radioactive count so that obtained that of decontamination factor of the different radioactive nuclides. The decontamination factor for different radioactive nuclides show up to table 2.

Tab.2 Decontamination factor for different radioactive nuclides

| Radioactive nuclides | $^{147}Pm$ | $^{137}Cs$ | $^{95}Zr$-$^{95}Nb$ | $^{90}Sr$-$^{90}Y$ | $^{103}Ru$ |
|---|---|---|---|---|---|
| Before decontamination Bq | 686900 | 185536 | 201798 | 854490 | 89142 |
| After decontamination Bq | 36 | 64 | 102 | 42 | 88 |
| Decontamination factor | $1.9\times10^4$ | $2.9\times10^3$ | $1.9\times10^3$ | $2.0\times10^4$ | $1.0\times10^3$ |

[1] Zheng Jishu, et al.(1977) Atomic Energy Science and Technology V.1 P.61.
[2] G. Kock et al.(1973) Symp.On the Management of Radioactive Wastes from Fuel Reprocessing P.1081.