Metal Technetium — Cyclotron Target for the ⁹⁷Ru Production

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Metallic technetium is excellent for cyclotron targets whose heat release may be as high as $3~\rm kW \cdot g^{-1}$ and more. It is hard elastic metal of density 11.5 g·cm⁻³, corrosion-resistant up to 300°C, with high thermal conductivity and a melting point about at 2500K.

The conditions for using $^{99}{\rm Tc}_{met}$ as a target material for the medical isotope $^{97}{\rm Ru}$ (T_{1/2} = 2.9 d; EC; E_{γ} = 216 and 324 keV) production first were studied.

Proton induced reactions on ⁹⁹Tc target were measured in order to evaluate the ⁹⁹Tc(p, 3n)⁹⁷Ru reaction as a source of ⁹⁷Ru. The condition of the irradiation and radiochemical separation of ⁹⁷Ru from Tc target material were searched.

The 97 Ru thick-target yield really obtained during one hour irradiation of Tc_{met} (~ 3 g· cm⁻²; ~ 1.2 g) with a proton beam inside the JINR phasotron vacuum chamber ($E_p = 50$ MeV, $I \sim 8 \mu A$) was equal to 45-50 mCi·h⁻¹.

The method of radiochemical separation of ultramicroamounts of ruthenium and macroamounts of the technetium was developed. It is based on RuO₄ distillation from HNO₃ or H₂SO₄ solutions at 90°C with air flow. This technique provides well reproduced results, does not involve complicated operations and yields little radioactive wastes (<100 ml). The chemical yield of ⁹⁷Ru is not less than 95%, the decontamination factor is more 10⁴, the duration of chemical operation is 6–7 hours. It can be use for production of ⁹⁷Ru preparation with high specific volume activity and in the form suitable for further synthesis of ⁹⁷Ru radiopharmaceuticals.

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restatic X ray electron spectrometer made by "Hewlett-Packard analogous RPS-2 spectrometer made in Russia. The energy resolution of instruments was equal to about 4 eV. The sources of the ouversion electrons were prepared by the electrolysis method. The C-ray photoelectron spectroscopy (XPS) method was used for montoring of the chemical state of sources. To eliminate the substantial affuence of the oxygen contamination on CES spectra, the measure