Metal Technetium — Cyclotron Target for the ^{97}Ru Production

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Metallic technetium is excellent for cyclotron targets whose heat release may be as high as 3 kW·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 $^{99}Tc_{met}$ as a target material for the medical isotope ^{97}Ru ($T_{1/2}$ = 2.9 d; EC; E_γ = 216 and 324 keV) production first were studied.

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

The ^{97}Ru thick-target yield really obtained during one hour irradiation of Tc_{met} ($\sim$ 3 g· cm^{-2}; $\sim$ 1.2 g) with a proton beam inside the JINR phasotron vacuum chamber (E_p = 50 MeV, I$\sim$8 μA) 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 RuO_4 distillation from HNO_3 or H_2SO_4 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 ^{97}Ru is not less than 95%, the decontamination factor is more 10^4, the duration of chemical operation is 6–7 hours. It can be use for production of ^{97}Ru preparation with high specific volume activity and in the form suitable for further synthesis of ^{97}Ru radiopharmaceuticals.

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