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## Production of artificial metal ruthenium from irradiated technetium

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Long-lived nuclide 99Tc is accumulated as a fission product in 1-3 kg/t quantities in fuel of nuclear power plants. Transmutation of technetium by the action of neutrons is the most cardinal method for its neutralization and disposal; this leads to the production of artificial stable 100Ru, 101Ru. Several technetium targets have been irradiated at SSC RIAR. Metal technetium in the form of disks was irradiated in the neutron trap of the SM reactor. Specimens resulting from the irradiation were found to represent Tc-Ru alloys. Prior to our work no description of the production of artificial metal ruthenium from irradiated technetium was available elsewhere.

This paper presents two different procedures for the production of artificial metal ruthenium from irradiated technetium targets. In one of this procedures the targets were dissolved in KOH solutions at the presence of KIO4 followed by precipitation of Ru(IV) hydroxide with ethanol. To purify the produced ruthenium from technetium traces, it was distilled as RuO4 into the ethanol aqueous solution where it was reduced and precipitated as Ru(IV) hydroxide. To produce metal ruthenium, Ru(IV) hydroxide precipitate was calcinated up to RuO2 and then reduced to metal in hydrogen flow.

According to the other procedure for separation of stable ruthenium from the irradiated technetium target use was made of a catalytic oxidation with ozone. Firstly, a Tc-Ru alloy specimen was placed into HNO3 or HClO4 solution containing Ag(I) ( or Co(II) ) ions. Then the ozone-oxygen mixture was bubbled through the solution. Formed by action of ozone Ag(I) ( or Co(II) ) ions oxidized the alloy (Tc and Ru) components transferring them to the solution. Then RuO4 and some part of HTcO4 were distilled to NaOH solution where RuO4 was reduced to sodium ruthenate. At the next process stage the Ru(IV) hydroxide was precipitated from the solution by the action of ethanol acting as a selective reducer of Ru(IV). The precipitate was placed into water and the ozone-oxygen mixture was bubbled through the hydroxide suspension formed in water. The Ru(IV) hydroxide was reduced to RuO4 with ozone, which was distilled to ethanol aqueous solution by the bubbled gas flow. The produced Ru(IV) hydroxide was transformed to RuO2 , which was reduced to metal in the helium-oxygen mixture.

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