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UNIVERSITY OF CALIFORNIA — BERKELEY

RADIATION LABORATORY

DISCLAIMER

CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS

XX. PREPARATION AND ISOLATION OF $Ru^{97,103}$ FROM MOLYBDENUM*

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Alpha-particle bombardment of molybdenum produces the 2.8-day Ru^{97} and the 42-day Ru^{103} by the nuclear reactions, $Mo(\alpha,xn)Ru^{97}$, and $Mo^{100}(\alpha,n)Ru^{103}$.(1) This paper reports a method of isolating this activity in the carrier-free state from the target element and from radioisotopes of Tc (from α,pxn reactions) which are produced concurrently by the 40-Mev alpha-particles from the 60-inch cyclotron at the Crocker Laboratory.

The target was a block of C.P. molybdenum metal, silver-soldered to a water-cooled copper target plate. It was bombarded with 40-Mev alpha-particles for a total of 70 μa-hr. at an average beam intensity of 8 μa. The bombarded surface was removed by milling off approximately 0.5 g of Mo. The Mo chips were fused with 5 g of KOH and 0.5 g of KNO_3 in a nickel crucible at 500° C. for 15 minutes. The fused mass was dissolved in a minimum amount of hot water and centrifuged to remove insoluble material. The strongly basic solution was transferred to an all-glass distilling flask,(2) a stream of Cl_2 was bubbled through the solution, and the active ruthenium was distilled as the RuO_4 which was collected in a trap containing 12 N HCl cooled with ice. Under these conditions the technetium isotopes remain in the distilling flask with the target material. The acid

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(1) Nuclear Data, National Bureau of Standards, Sept. 1, 1950.

(2) L. A. Scherrer, J. Research Nat. Bur. Stand., 21, 95, (1938).

distillate containing the radio-ruthenium was evaporated to a small volume, made basic with NaOH, and redistilled into a trap containing 12 N HCl. The second distillation was done to insure complete separation from the target material. The final HCl solution was evaporated to dryness on 20 mg of NaCl and the activity dissolved quantitatively with the addition of 2 ml of distilled water.

An aliquot of the preparation was added to a solution containing carrier amounts of Mo and Ru. The activity was quantitatively recovered in the Ru fraction following chemical separation. The radiation characteristics were obtained by aluminum and lead absorption measurements and showed the 0.2-Mev conversion electron and the 0.23-Mev gamma-ray previously reported[3] for Ru^{97}. The activity showed the 2.8-day period for nearly 15 half-lives at which time it began to lengthen to a period of approximately 40 days, presumably due to Ru^{103}.

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(3) D. T. Eggen and M. L. Pool, Phys. Rev. 74, 57, (1948).