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CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS XXVI. PREPARATION AND ISOLATION OF W^{181} FROM TANTALUM

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CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS XXVI. PREPARATION AND ISOLATION OF W^{181} FROM TANTALUM*

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Deuteron bombardment of tantalum produces the 140-day W^{181} by the nuclear reaction[1] $Ta^{181}(d,2n)W^{181}$. This paper reports a radiochemical isolation of carrier-free W^{181} from a tantalum target bombarded with 19 Mev deuterons in the 60-inch cyclotron at Crocker Laboratory. Other possible concurrent reactions include formation of radioisotopes of tantalum by the (d,p) reaction and hafnium by the (n,p) reaction.

The target, a circular plate of tantalum metal[2] approximately 10 mils thick, mounted in a bell-jar type of target assembly, was bombarded with 19 Mev deuterons for a total of 500 microampere-hours at an average beam intensity of 20 microamperes. The back of the tantalum foil was cooled with a stream of cold water. After bombardment, the tantalum foil was trimmed and the inactive metal discarded. The tantalum was dissolved in a minimum volume of 16 N HNO_3 containing 10 percent HF by

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(1) G. T. Seaborg and I. Perlman, Rev. Mod. Phys. 20, 585 (1948)

(2) Spectrographic analysis of tantalum foil showed it to be tungsten-free.

volume in a platinum evaporating dish. The HF was removed by boiling with 36 N H_2SO_4 and the cooled acid solution poured slowly into an excess of 20 per cent NaOH with constant stirring. The precipitate was digested for 30 minutes and the tantalum hydroxide separated by centrifugation with repeated reductions in volume of the basic solution. The carrier-free tungsten was retained in the supernatant. This process was repeated three times to insure complete removal of the radio-tungsten from the tantalum target. The combined supernatants were evaporated to a small volume, the Na_2SO_4 formed by evaporation was centrifuged out, and the radio-tungsten was recovered in the supernatant. The basic solution was acidified with HCl, 5 mg of Fe^{+3} were added and the solution carefully brought to pH 4 with NaOH. At this pH the $Fe(OH)_3$ carries the radio-tungsten quantitatively. Three such precipitations were done to insure the complete removal of any tantalum present. The $Fe(OH)_3$ was dissolved in 6 N HCl and the iron extracted with ethyl ether. The aqueous phase containing HCl and W^{181} was evaporated to dryness on 20 mg NaCl. The activity dissolved quantitatively in distilled water.

The decay curve was followed for 130 days and showed the 140-day half-life of W^{181}. Mass absorption measurements in aluminum and lead showed the 0.07 Mev conversion electron and the 0.13 Mev and 1.8 gamma rays previously reported for W^{181} (3). A trace amount of carrier-free tungsten was added to a solution containing milligram amounts of tungsten, tantalum and hafnium= the tungsten fraction was separated chemically and contained 98 per cent of the activity.

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(3) G. Wilkinson, Nature, 160, 864 (1947)