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CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS
V. PREPARATION AND ISOLATION OF Se^{75} FROM ARSENIC

Warren M. Garrison, Roy D. Maxwell, and Joseph G. Hamilton

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CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS V. PREPARATION AND ISOLATION OF Se^{75} FROM ARSENIC[1]

Warren M. Garrison, Roy D. Maxwell[2] and Joseph G. Hamilton.

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Deuteron bombardment of arsenic produces 127 day Se^{75} by the nuclear reaction[3], $As^{75}(d,2n)Se^{75}$. This paper reports a radio-chemical isolation of carrier-free Se^{75} from an arsenic target bombarded with 19 Mev deuterons in the 60-inch cyclotron at the Crocker Laboratory. The possible[4] radioisotopes of germanium (from n,p reaction) and gallium (from n,α reaction) were allowed to decay out prior to the separation.

A 2 mm layer of C.P. arsenic powder, supported on a grooved water cooled copper plate by a 0.25 mil tantalum foil, was bombarded for 100 μa-hr at a beam intensity of 8 μa. After aging for 24 hours, the bombarded arsenic was dissolved in a minimum volume of aqua regia. 12 N HCl was added to destroy excess HNO_3 and the solution was adjusted to 3 N. 10 mg of tellurous acid were added and precipitated as elemental tellurium with SO_2; approximately 95% of the Se^{75} carried. The supernatant showed the 26.8 hour period of As^{76}. The tellurium precipitate containing the carrier free radio-selenium was dissolved in 16 N HNO_3 and reprecipitated from 3 N HCl in the presence of arsenic hold-back carrier. Two additional

(1) This document is based on work performed under the auspices of the Atomic Energy Commission.

(2) Lieutenant Colonel, U. S. Army, now stationed at Walter Reed Hospital, Washington, D. C.

(3) C. V. Kent, J. M. Cork, and W. G. Wadey, Phys. Rev. 61 389 (1942)

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

precipitations removed traces of carrier arsenic.

The tellurium precipitate was washed, dissolved in a minimum volume of 16 N HNO_3 and transferred to an all-glass distilling flask[5]. 14% HBr was added dropwise while a stream of N_2 carrier-gas was bubbled through the solution at 200° C. Under these conditions, selenium forms the volatile tetrabromide while tellurium is quantitatively retained in the residue. The distillate, containing the carrier-free Se^{75}, HBr and Br_2 was collected in a water trap cooled with ice. HBr was removed with HNO_3 and the solution was evaporated to dryness on 40 mg of NaCl after the addition of excess HCl. The activity, presumably as selenate, was quantitatively soluble in 5 ml of water. The resultant isotonic solution of carrier-free radio selenium was used in subsequent biological experiments.

The Se^{75} was identified by the assigned[6] 120-day half-life and by the 0.45 Mev gamma ray[7]. Chemical separations with added arsenic and selenium carriers further identified the activity as Se^{75}.

We are grateful to Professor G. T. Seaborg for checking the manuscript, to the staff of the 60-inch cyclotron for bombardments, and to Mrs. Alberta Mozley and Mrs. Helen Haydon for technical assistance.

(5) J. A. Scherrer, J. Research Natl. Bur. Standards, 21 95 (1938)

(6) H. H. Hopkins, Jr. and B. B. Cunningham, Phys. Rev. 73 1406 (1948)

(7) W. S. Cowart, M. L. Pool, D. A. McCown, and L. L. Woodward, Phys. Rev. 73 1454 (1948)

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