

Lawrence Berkeley National Laboratory

Recent Work

Title

Carrier-Free Radioisotopes from Cyclotron Targets II. Preparation and Isolation of Cd109 from Silver

Permalink

<https://escholarship.org/uc/item/02d2f0dj>

Authors

Maxwell, R.D.
Haymond, H.R.
Garrison, W.M.
et al.

Publication Date

1949-08-11

UNIVERSITY OF
CALIFORNIA

*Radiation
Laboratory*

TWO-WEEK LOAN COPY

*This is a Library Circulating Copy
which may be borrowed for two weeks.
For a personal retention copy, call
Tech. Info. Division, Ext. 5545*

BERKELEY, CALIFORNIA

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

UNCLASSIFIED
UNIVERSITY OF CALIFORNIA

Radiation Laboratory

Contract No. W-7405-eng-48

CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS
II. PREPARATION AND ISOLATION OF Cd^{109} FROM SILVER

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

August 11, 1949

Berkeley, California

CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS,
II PREPARATION AND ISOLATION OF Cd^{109} FROM SILVER¹

Roy D. Maxwell², Herman R. Haymond, Warren M. Garrison, and Joseph G. Hamilton.

Crocker Laboratory, Radiation Laboratory, and Divisions of Medical Physics, Experimental Medicine, and Radiology; University of California, Berkeley and San Francisco.

The radionuclide, Cd^{109} , produced by the nuclear reaction $\text{Ag}^{109}(\text{d},2\text{n})^3$, has been isolated without added isotopic carrier by a solvent-extraction procedure based on the selective solubility of cadmium pyridine thiocyanate in chloroform. Radioactive palladium, 13-hr. Pd^{109} , produced by the reaction $\text{Ag}^{109}(\text{n},\text{p})$, was allowed to decay out prior to the separation of 185-day Cd^{109} . This activity, however, is not extracted with cadmium and the method may be used in isolating 6.7 hr. Cd^{107} from an un-aged target.

The target was a block of spectrographically-pure silver⁴ (1/4 in. thick), soldered to a water-cooled copper plate. It was bombarded with 19 Mev deuterons for a total of 100 μa -hrs. in the 60-inch cyclotron at Crocker Laboratory. The bombarded surface of the silver was removed from the target by milling off to a depth of 1/8 in.

The silver turnings were dissolved in a minimum volume of 16 N HNO_3 and the solution was evaporated to dryness on a steam bath. The AgNO_3 plus activity was

- (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) A. C. Helmholtz, Phys. Rev., 70, 982 (1946)
- (4) The silver was obtained from Johnson Mathey & Co. Cadmium was not detected by spectrographic analysis.

dissolved in 25 ml of H_2O and the silver was complexed with excess NH_4CNS . The solution was adjusted to pH 5 with sodium acetate and the Cd^{109} was extracted with chloroform containing 5% pyridine. This procedure, originally developed⁵ for the separation of micro amounts of cadmium, quantitatively extracted Cd^{109} from solutions containing presumably less than 10^{-8} grams of stable cadmium.

To remove traces of silver, the chloroform phase was evaporated to dryness on a steam bath, redissolved in 2-3 ml of 1% H_2SO_4 , and extracted with .005% dithizone in chloroform⁶. The final solution of Cd^{109} contained less than one microgram of silver.

A small portion of the activity was added to a solution containing silver and cadmium in carrier amounts, and the silver was precipitated as $AgCl$. 99% of the activity remained in the supernatant.

Absorption measurements in aluminum showed conversion electrons of approximately 0.1 Mev and the 22 Kev X-ray of the Ag^{109} daughter. These data agree with the previously reported values³.

The authors wish to express their appreciation to the crew of the 60-inch cyclotron for the bombardments, and to Mrs. Alberta Mozley and Mrs. Helen Haydon for technical assistance in counting.

July 1949

(5) H. Fischer and G. Leopoldi, *Mikrochim, Acta*, 1, 30 (1937).

(6) E. B. Sandell, Colorimetric Determination of Traces of Metals, Interscience Publishers, Inc., New York, 1944.