Lawrence Berkeley National Laboratory
Recent Work

Title
MASS ASSIGNMENT OF 14.6 HOUR YTTRIUM POSITRON ACTIVITY

Permalink
https://escholarship.org/uc/item/0ws7m4bp

Author
Castner, S.V.

Publication Date
1951-01-31

eScholarship.org Powered by the California Digital Library
University of California

UCRL- 1099

Copy 2

UNIVERSITY OF CALIFORNIA — BERKELEY

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

RADIATION LABORATORY

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.

UCRL-1099
Unclassified - Chemistry Distribution

Copy 2

UNIVERSITY OF CALIFORNIA

Radiation Laboratory

UNCLASSIFIED

Contract No. W-7405-eng-48

MASS ASSIGNMENT OF 14.6 HOUR YTTRIUM POSITRON ACTIVITY

S. V. Castner

January 31, 1951

Berkeley, California

MASS ASSIGNMENT OF 14.6 HOUR YTTRIUM POSITRON ACTIVITY

S. V. Castner
Radiation Laboratory and Department of Chemistry
University of California, Berkeley, California

January 31, 1951

In searching for neutron deficient zirconium isotopes, a new yttrium activity was found, which was shown[1] to grow from a zirconium isotope which decays by means of electron capture with a half-life of 17 hours. This yttrium activity decays with a half-life of 14.6 hours (Fig. 1). The mode of decay is by positron emission and gamma radiation. No conversion electrons and no K x-radiation are observed. The gamma radiation has an energy of approximately 1.3 mev by a lead absorption measurement (Fig. 2). The positrons showed on resolution with the 270° beta ray spectrometer to be composed of two groups with maximum energies 1.15 and 1.77 mev.[1] This 14.6 hour activity has been assigned to Y^{86} on the following interpretation of experimental results.

Careful chemical separations after a reasonable growth period showed no activity appearing in the strontium fraction of half-life between ten minutes and 100 days. This rules out the possibility of this activity belonging to Y^{81}, Y^{82}, Y^{83}, and makes it improbable that the activity belongs to Y^{85} or Y^{87}.

A bombardment of SrO enriched to 98.9% Sr^{88} with 10 mev protons gave no 14.6 hour activity of any kind in the yttrium fraction. This eliminates the possibility of the new activity belonging to Y^{88}.

A second bombardment of the enriched $Sr^{88}O$ with 25 mev protons gave the 14.6 hour positron activity in high yield. A similar bombardment[2] with this energy protons on Rb^{85} produces Sr^{83} in approximately equal yield but does not produce Sr^{81} or Sr^{82}. Thus Y^{84} and Y^{85} are eliminated. The work of Robertson and Pool[3] also eliminates Y^{84}.

This leaves only Y^{86} and Y^{87} as possibilities. It is more convenient to place the new activity at Y^{86} than at Y^{87} by the following reasoning. The parent of Y^{86} is 17 hour Zr^{86}. The parent of Y^{87m} is 93 minute Zr^{87}. Y^{86} decays directly to stable strontium. Y^{87m} decays to Y^{87}, thence to Sr^{87m} and finally to Sr^{87}, which is stable. Thus unless the two zirconium isotopes are isomers of Zr^{87}, which decay to stable strontium by two entirely different and separate paths with no identical states or crossovers between the two paths, the new activity belongs to Y^{86}.

---

[1]E. K. Hyde and G. D. O'Kelley, University of California Radiation Laboratory Unclassified Report UCRL-1064 (December, 1950).

[2]S. V. Castner, University of California Radiation Laboratory Unclassified Report UCRL-942 (October, 1950).

[3]B. E. Robertson, W. E. Scott, and M. L. Pool, Phys. Rev. 76, 1649 (1949).

LIST OF ILLUSTRATIONS

Figure

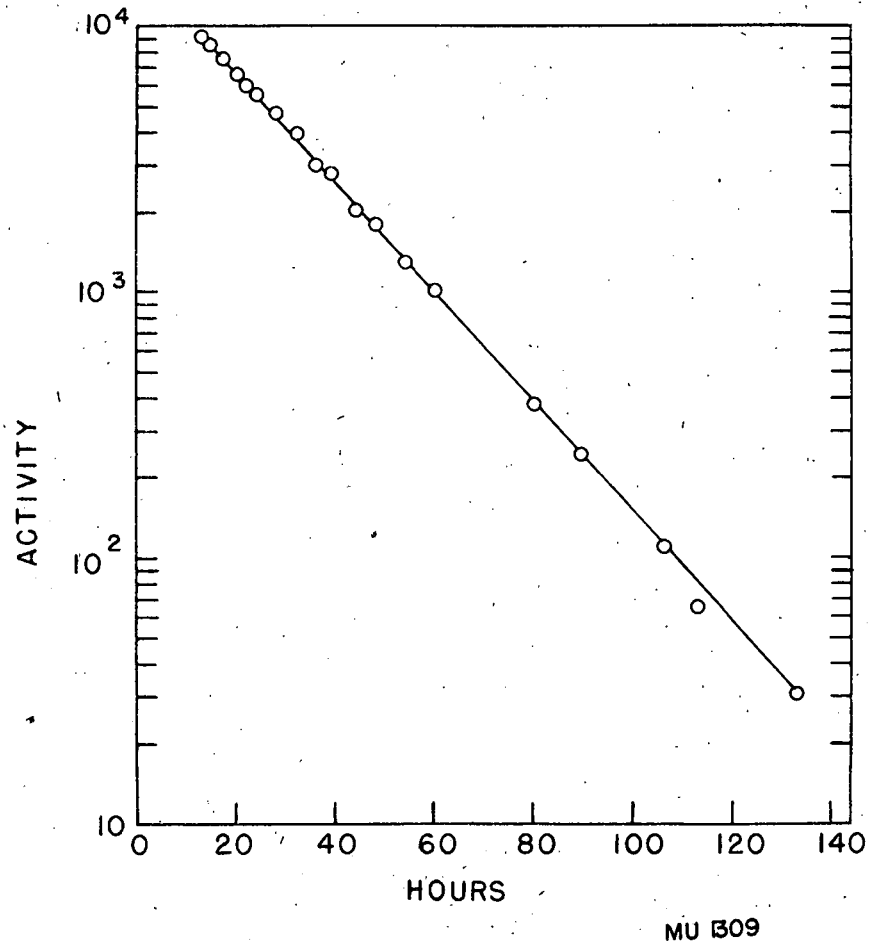

Fig. 1

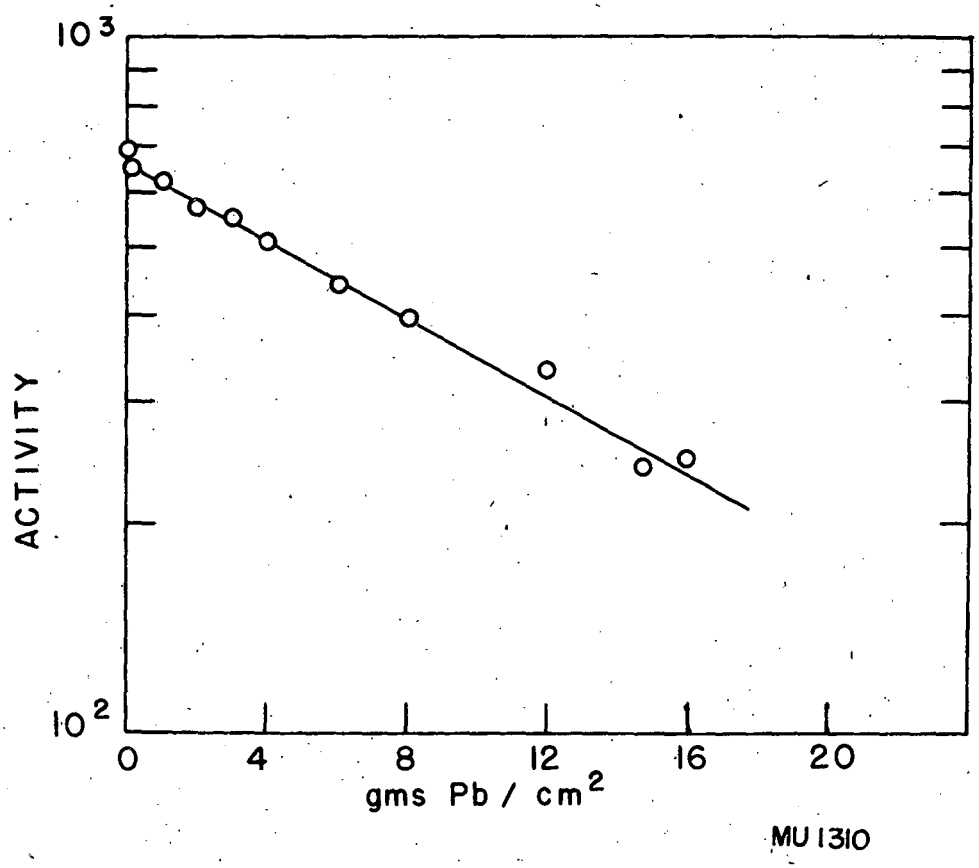

Fig. 2