

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

UCRL-186
0.2

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.

RESTRICTED

UCH 186
Physics-General

UNIVERSITY OF CALIFORNIA

Radiation Laboratory
Special Review of Declassified Reports
Authorized by USDOE JK Bratton
Unclassified TWX P182206Z May 79

REPORT PROPERLY DECLASSIFIED

<u>J N Green</u>	<u>8/16/79</u>
Authorized Derivative Classifier	Date
<u>R O K Albert</u>	<u>8/17/79</u>
By	Date

MASS SPECTROGRAPHIC ASSIGNMENT OF RUBIDIUM ISOTOPES

BY

Frederick L. Reynolds, D. C. Karraker,
and David H. Templeton

September 29, 1948

CAUTION

This document contains information affecting the National Defense of the United States. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalties under applicable Federal laws.

Berkeley, California

RESTRICTED
DECLASSIFIED BY AUTHORIZED PERSONNEL
BY THE DECLASSIFICATION COMMITTEE

STANDARD DISTRIBUTION: Series A	Copy Numbers
Argonne National Laboratory	1-8
Armed Forces Special Weapons Project	9
Atomic Energy Commission, Washington	10-11
Battelle Memorial Institute	12
Brookhaven National Laboratories	13-20
Carbide & Carbon Chemicals Corporation (K-25 Area)	21-24
Carbide & Carbon Chemicals Corporation (Y-12 Area)	25-28
Columbia University (Dunning)	29
General Electric Company	30-33
Hanford Directed Operations	34-38
Iowa State College	39
Los Alamos	40-42
Monsanto Chemical Company, Dayton	43-44
National Bureau of Standards	45-46
Naval Radiological Defense Laboratory	47
NEPA	48
New York Directed Operations	49-50
Oak Ridge National Laboratory	51-58
Patent Advisor, Washington	59
Technical Information Division, ORDO	60-74
UCLA Medical Research Laboratory (Warren)	75
University of California Radiation Laboratory	
Information Division	76-78
Chemistry Dept, Bldg 5	79
Patent Department	80
University of Rochester	81-82
Chicago Office of Directed Operations	83
Declassification Procedure	84-93

INFORMATION DIVISION
Radiation Laboratory
Univ. of California
Berkeley, California

RESTRICTED

MASS SPECTROGRAPHIC ASSIGNMENT OF RUBIDIUM ISOTOPES

Frederick L. Reynolds, D. G. Karraker,
and David H. Templeton

Radiation Laboratory and Department of Chemistry
University of California, Berkeley, California

September 29, 1948

We have used a mass spectrograph to investigate rubidium isotopes produced by bombardment of bromine (ammonium bromide) with helium ions in the Berkeley 60-inch and 184-inch cyclotrons. The 60° deflection spectrograph is similar to that of Lewis and Hayden¹ but with larger dimensions and all-metal construction².

In each bombardment with 20 to 100 Mev helium ions there was a good yield of rubidium activity with half-life about 6 hours. The rubidium activities were separated from the target material using 20-30 micrograms of inactive rubidium carrier and divided into two portions. One part was further purified and used for decay and absorption measurements. The other major portion was placed on the tungsten filament of the mass spectrograph as the nitrate or chloride. The Rb^+ ions produced by heating this filament were analyzed by the instrument and caught on a photographic plate. The mass scale was fixed by the lines of stable Rb^{85} and Rb^{87} . Lines at masses 81 and 82 were shown to be radioactive both by the photographic transfer technique (Fig. 1) and by counting with a Geiger counter provided with a narrow slit. With 80 Mev helium ions 5.0 hour Rb^{81} predominated in the mixture, and with 20 Mev helium ions almost pure 6.3-hour Rb^{82} was obtained. Otherwise the similar half-lives would have made characterization of the radiations, which are listed in Table I, very difficult. The

signs of the particles were determined with a crude 180° deflection beta spectrograph. The energies listed in Table I were obtained with this instrument or from absorption measurements with aluminum, beryllium, or lead, as indicated.

The previously reported³ 6.5-hour rubidium activity assigned to Rb^{84} was presumably Rb^{82} or a mixture of Rb^{82} and Rb^{81} . No description of the radiations was reported.

Attempts to observe a krypton daughter of Rb^{81} have shown no positive results. Experiments are under way to characterize some longer-lived activity produced in these same bombardments due to Rb^{83} and perhaps Rb^{84} . Barber⁴ has reported a 40-day positron emitter which he attributed to Rb^{84} .

The cooperation of Mr. J. T. Vale, Mr. B. Rossi, and the crews of the 184-inch and 60-inch cyclotrons is gratefully acknowledged.

This paper is based on work performed under the auspices of the Atomic Energy Commission.

References

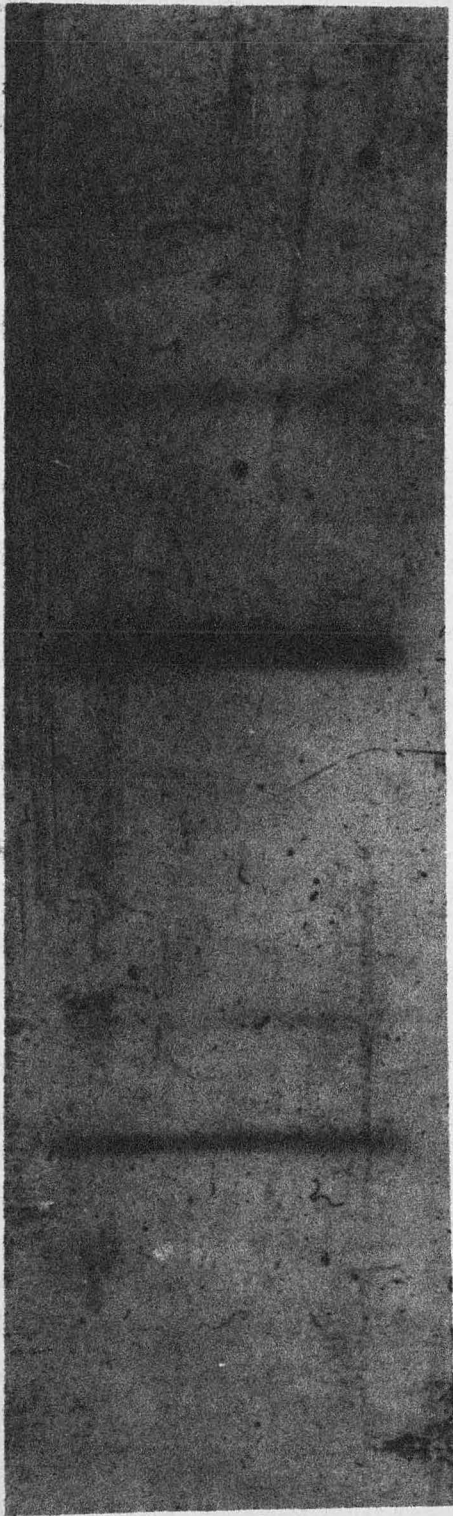
- ¹L. G. Lewis and R. J. Hayden, U. S. Atomic Energy Commission Report MDDC 1556, "A Mass Spectrograph for Radioactive Isotopes" (1947); R. J. Hayden, Phys. Rev. 74, 650 (1948).
- ²We are greatly indebted to Dr. A. J. Dempster, Dr. M. G. Inghram, and Dr. R. J. Hayden for information and advice concerning their techniques and the design of this instrument.
- ³J. O. Hancock and J. C. Butler, Phys. Rev. 57, 1088 (1940).
- ⁴W. C. Barber, Phys. Rev. 72, 1156 (1947).

Table I
Radiations from Rubidium Isotopes

Isotope	Half-life	Radiations	e^-/β^+ ratio
Rb ⁸¹	5.0 hours	β^+ 0.7 Mev (abs.Al)	~1
		e^- 0.2 Mev (spect.)	
		γ 0.8 Mev (abs.Pb)	
		K x-rays (abs.Al,Be)	
Rb ⁸²	6.3 hours	β^+ 0.6 Mev (abs.Al)	<0.02
		γ 1.0 Mev (abs.Pb)	
		K x-rays (abs.Al,Be)	

Fig. 1

The original plate shows stable Rb^{85} and Rb^{87} and radioactive Rb^{81} and Rb^{82} . The "transfer" plate is placed emulsion-to-emulsion with the original for several hours before either is developed, to locate radioactive material.



a.



b.

| | | | |
81 82 85 87

FIG. 1

RESTRICTED

CLASSIFICATION CONTAINED BY AUTHORITY
OF THE DEPARTMENT ENGINEER
BY THE DECLASSIFICATION COMMITTEE