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MASS-SPECTROGRAPHIC IDENTIFICATION OF Cm243 AND Cm244

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Authors

Reynolds, F.L.

Hulet, E.K.

K.

et al.

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MASS-SPECTROGRAPHIC IDENTIFICATION OF Cm²⁴³ AND Cm²⁴⁴

F. L. Reynolds, E. K. Hulet, and K. Street, Jr.

June 20, 1950

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MASS-SPECTROGRAPHIC IDENTIFICATION OF Cm²⁴³ AND Cm²⁴⁴

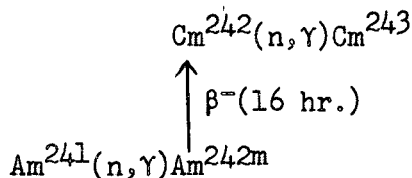
F. L. Reynolds, E. K. Hulet, and K. Street, Jr.
Radiation Laboratory and Department of Chemistry
University of California, Berkeley, California

The isotopes Cm²⁴³ and Cm²⁴⁴ have been identified mass-spectrographically. The curium fraction from a long neutron irradiation of Am²⁴¹ was separated chemically and its isotopic composition determined by means of the 60° focusing mass spectrograph used in this laboratory for work with radioactive isotopes. A thermal ion source was used and the ions were recorded photographically. Fig. 1 is a reproduction of the plate obtained.

The Am²⁴¹ which is responsible for the rather intense line at mass 241 and the much fainter line at mass 257 (Am²⁴¹O⁺) represents a very small fraction of the initial Am²⁴¹ target material that was not successfully separated in the chemistry. The line at mass 254 is due to Pu²³⁸O⁺ which grew in from the alpha-decay of Cm²⁴² after the chemical separation. The Cm²⁴² appears to a small extent as the metal at mass 242 and much more intensely as Cm²⁴²O⁺ at mass 258. The ghost line one third of a mass unit to the right of mass 258 is a characteristic of the machine and appears often on intense spectra. The isotopes Cm²⁴³ and Cm²⁴⁴ because of their small abundances are detected only at the more intense oxide masses 259 and 260.

A photometer tracing of the plate gave the semiquantitative information that Cm²⁴³ and Cm²⁴⁴ are of about equal abundance in this sample and that each is about 1 percent as abundant as Cm²⁴².

The Cm²⁴³ was produced by the following sequence of nuclear reactions:



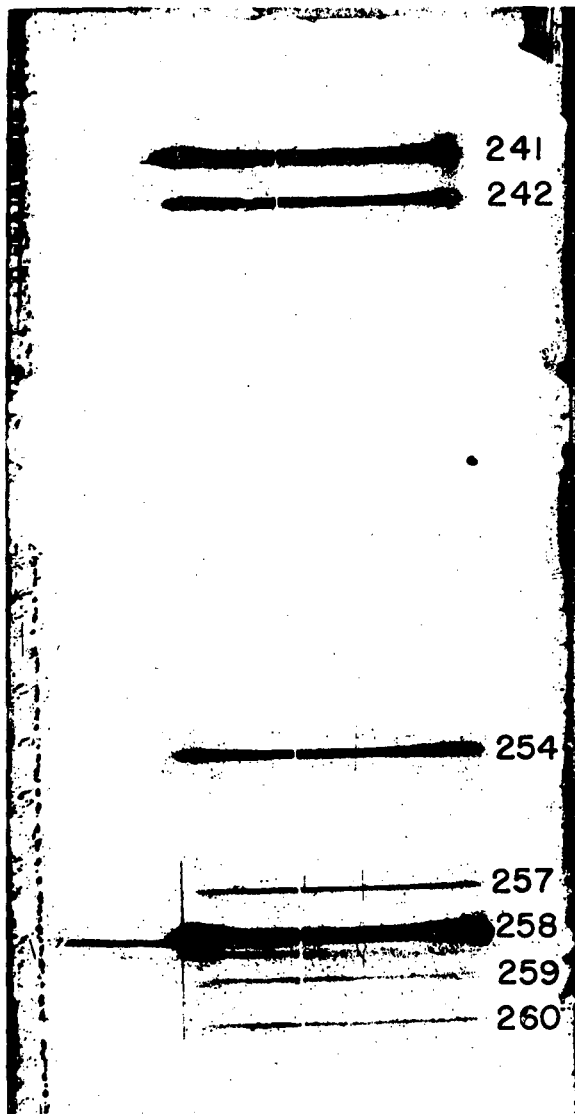
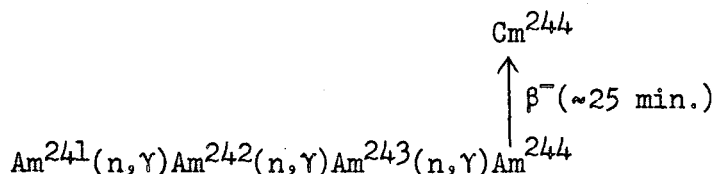


Fig. 1 MU 398

Isotopic composition of the curium fraction
from a long neutron irradiation of Am^{241}

The Cm²⁴⁴ was undoubtedly produced both by neutron capture in the Cm²⁴³ formed as above and also by the following path:¹



Alpha-particles ascribed to Cm²⁴³ have been seen previously^{2,3} but the mass spectrographic identification of Cm²⁴⁴ represents the first definite evidence for this isotope.

From the energy balances involved one expects Cm²⁴³ to be slightly unstable with respect to orbital electron capture,¹ or possibly beta stable. The alpha-decay systematics⁴ predict that Cm²⁴⁴ is beta stable with an alpha-decay half-life of years.

We would like to express our appreciation to Dr. S. G. Thompson for his very valuable assistance in carrying out this work. This work was performed under the auspices of the AEC.

¹Street, Ghiorso, and Seaborg, Phys. Rev. (in press).

²Street, Thompson, and Ghiorso, (unpublished work).

³Thompson, Ghiorso, and Seaborg, Phys. Rev. (in press).

⁴Perlman, Ghiorso, and Seaborg, Phys. Rev. 77, 26 (1950).

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