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THE NEW ISOTOPE EINSTEINIUM-248

A. Chetham-Strode and L. W. Holm

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A. Chetham-Strode and L. W. Holm *

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

ABSTRACT

The new isotope E^{248} has been identified among the products of the deuteron bombardment of Cf^{249}. It decays principally by electron capture with a half-life of 25 ± 5 minutes and also by the emission of 6.87 ± .02-Mev alpha particles. A branching ratio (EC/α) of ~400 was determined from the amount of Cf^{248} formed by electron-capture decay of the new isotope. Partial excitation functions supporting the assignment to mass number 248 are presented.

*On leave from the Nobel Institute of Physics, Stockholm, Sweden.

THE NEW ISOTOPE EINSTEINIUM-248

A. Chetham-Strode and L. W. Holm*

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

A new isotope of einsteinium, E^{248}, has been identified among the products of the bombardment of Cf^{249} with 18- to 22-Mev deuterons. It decays principally by electron capture with a half-life of 25 ± 5 minutes and also by the emission of 6.87 ± .02-Mev alpha particles.

The deuteron bombardments were made in the 60-inch cyclotron of the Crocker Laboratory, using the recoil collection technique described elsewhere.[1,2] The target used for this work contained about 10^{13} atoms of monoisotopic Cf^{249} in addition to about 2×10^{13} atoms of its parent Bk^{249}. Immediately after bombardment the californium and einsteinium reaction products were separated by ion-exchange methods[3] and electrodeposited on platinum foil for examination by alpha pulse height analysis. From ten to thirty alpha events of 6.87 Mev were observed in each experiment in addition to larger amounts of E^{249} (α 6.76 Mev, 2 hours)[2] produced by the Cf^{249} (d,2n) reaction.

The atomic number of the new nuclide was established by its elution together with E^{249} from cation enchange resin, using α - hydroxyisobutyric acid as the eluting agent.[4] The assignment to mass number 248 was on the basis of the partial excitation function of Fig. 1. The approximate cross sections shown were calculated from the observed alpha disintegration rates and branching ratios, assuming recoil collection yields of 100% in the bombardments. The excitation function for the production of E^{248} is seen to differ qualitatively and quantitatively from that for the production of E^{249}, and to exhibit a shape consistent with that expected for the (d,3n) reaction. The assignment to mass number 247 is excluded by the observed production of the 25-minute activity below the threshold of the (d,4n) reaction, as calculated from the data of Glass, Thompson, and Seaborg.[5]

The electron capture - to - alpha decay branching ratio was determined from the amount of Cf^{248} (α 6.28 Mev, 225 days) which grew into a

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carefully separated sample of the einsteinium isotopes resulting from Cf^{249} (d,xn) reactions. From the observed counting rates of E^{248} and Cf^{248} in this experiment a branching ratio of about 400 (EC/α) was estimated.

It is a pleasure to acknowledge the cooperation of the staff and crew of the 60-inch cyclotron in this work. The authors are also indebted to B. G. Harvey, S. G. Thompson, and G. R. Choppin for their part in the preparation of the target material. The continued interest and encouragement of Professor G. T. Seaborg is gratefully acknowledged. This work was done under the auspices of the U. S. Atomic Energy Commission.

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LEGEND FOR FIGURE

Fig. 1. Excitation functions for the (d, 2n) and (d, 3n) reactions on Cf^{249}.

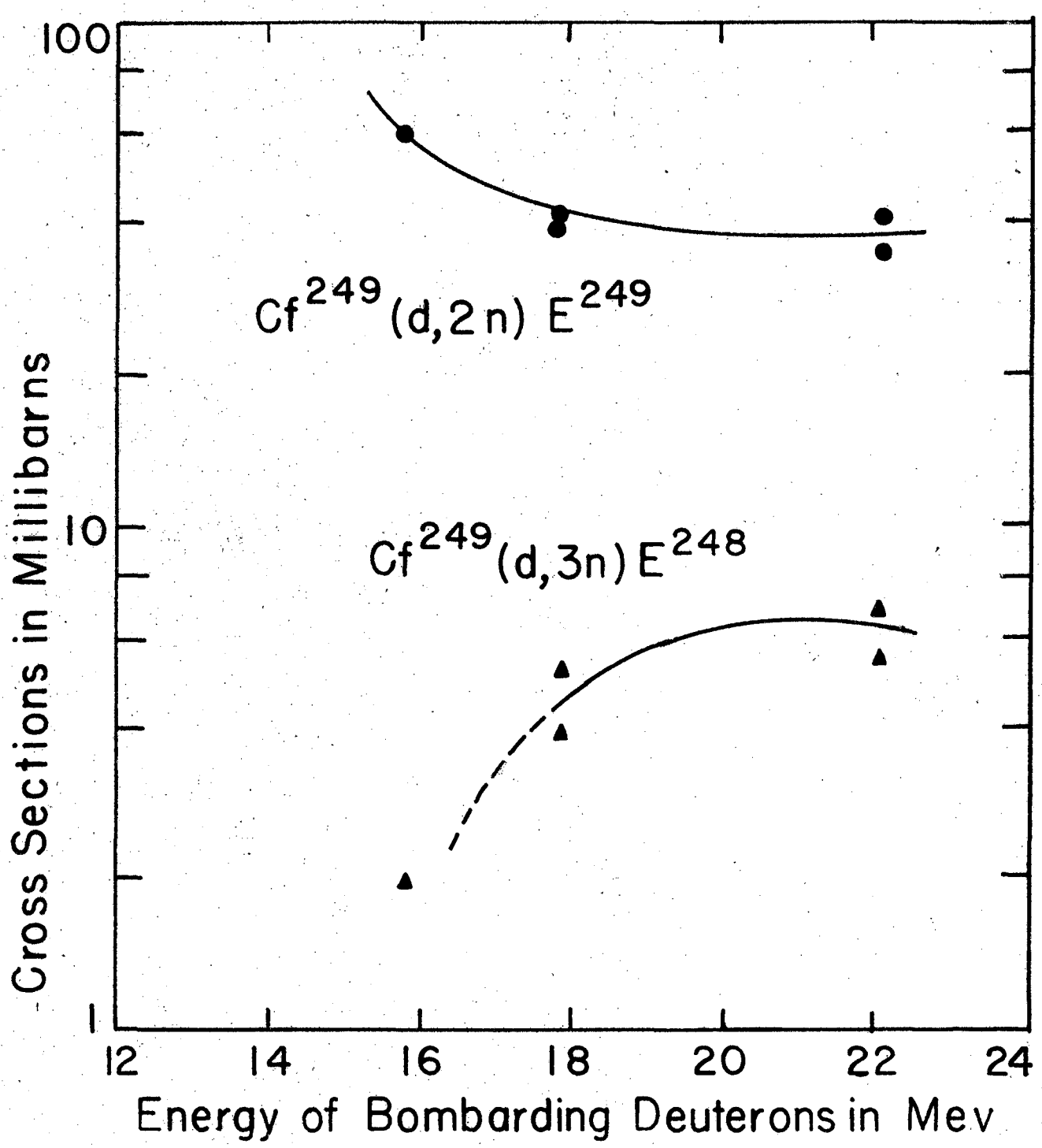
100
10
1
Cross Sections in Millibarns
$Cf^{249}(d,2n)\,E^{249}$
$Cf^{249}(d,3n)\,E^{248}$
12
14
16
18
20
22
24
Energy of Bombarding Deuterons in Mev

Fig 1

2351-1