New Isotope Einsteinium-248†

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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±0.02)-Mev alpha particles. A branching ratio (E.C./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.

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±0.02)-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.

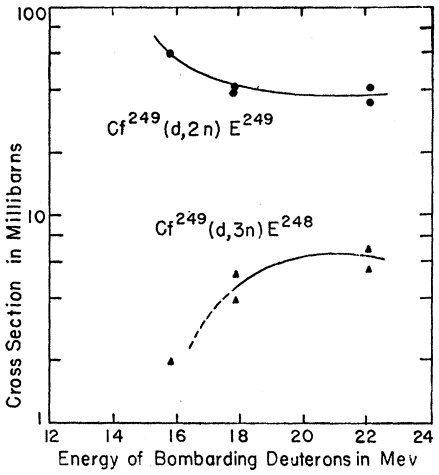

FIG. 1. Excitation functions for the (d,2n) and (d,3n) reactions on Cf^{249}.

The atomic number of the new nuclide was established by its elution together with E^{249} from cation exchange 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 carefully separated sample of the einsteinium isotopes resulting from Cf^{249} (d,$x$$n$) reactions. From the observed counting rates of E^{248} and Cf^{248} in this experiment a branching ratio of about 400 (E.C./α) was estimated.

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