

Daughters of the Alpha-Particle and Electron-Capture Decay

Following the complete decay of the berkelium radioactivity, differential alpha-pulse analysis of the residual activity indicated the peaks shown in Fig. 7. The new alpha-particle group of 5.84 Mev energy was taken to be the orbital electron-capture daughter of berkelium. The other peaks represent Pu²³⁹ contamination introduced from plutonium left in the laboratory from other experimental work and small amounts of Cm²⁴² and its daughter Pu²³⁸, incompletely separated in the original column runs. In this connection it should be noted that all of the alpha-radioactivity in the sample amounts to only a few disintegrations per minute.

No decay of the unknown 5.84-Mev alpha-particle group occurred over a period of a few weeks. The chemical separations to be mentioned below showed that this new group belongs to a new curium isotope, and that it was produced by the electron-capture decay of the 4.6-hour berkelium activity. The amount of the new curium alpha-radioactivity observed, together with the initial electron-capture disintegration rate of the 4.6-hour activity in the same sample, made it possible to calculate an alpha-particle decay half-life of $\sim 10^2$ years for the curium isotope. In this calculation the method described in the section on experimental work was used in which the disintegration rate of the 4.6-hour activity was calculated from its L x-ray counting rate in the xenon-filled Geiger counter at the time the berkelium was first isolated from other radioactivities. From this value, the total number of curium atoms produced by the complete decay of the berkelium was calculated and this, together with the disintegration rate of the curium thus produced, were used to calculate the half-life.

The americium and curium daughters produced by the electron capture and alpha-particle decay of the new 4.6-hour activity were separated chemically using a Dowex-50 resin column according to the method previously described. This separation was made approximately 27 hours after the berkelium fraction had been isolated from other radioactivities. At this time all except about 2 percent of