

A. Deuteron Bombardment of Pu²³⁹

Several targets of Pu²³⁹ were bombarded with 19 Mev deuterons in the sixty-inch cyclotron in order to produce americium isotopes of mass numbers 237 to 240. The targets were prepared by the evaporation of slurries of plutonium(IV) fluoride on rectangular platinum plates of one cm.² area (interceptor targets). After ignition in air, the samples were placed in the target chamber of the cyclotron in such a way as to intercept the most intense portion of the ion beam. As soon as possible after the end of bombardment, the samples were dissolved and processed chemically to yield rare-earth fractions by the successive precipitation of lanthanum(III) fluoride carrier from strongly oxidizing solutions. The actinide elements were separated from lanthanide elements by the precipitation of lanthanum(III) from 3 M HNO₃ - 1 M H₂SiF₆ solution.⁽⁷⁾ Such precipitates are known to carry 90 percent of rare-earth activities and only 10 to 30 percent of actinide activities. Recovery of the actinides (in this case americium) was effected by the addition of sufficient concentrated HF to precipitate the remaining lanthanum which under these conditions carries the transplutonium activities. Cycles such as this were repeated until the activity had a constant composition with respect to all types of radiation and until the chemical yield per cycle was that expected of americium isotopes.

Decay measurements were made under four sets of counting conditions, using a thin window (ca. 3 mg.cm.⁻² mica) Geiger tube detector:

- (1) 7 mg.cm.⁻² aluminum filter, to prevent the detection of alpha particles,
- (2) 1500 mg.cm.⁻² beryllium filter, to allow passage of most electromagnetic radiation, but stop all except the most energetic beta particles.