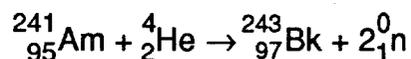


serve as target material. Because of the intense radioactivity of americium and curium, even in milligram or submilligram amounts, it was necessary to develop extremely efficient chemical separation methods to isolate the new elements from the target materials. This large degree of separation was necessary to detect the very small amounts of radioactivity due to the new elements produced in the presence of the highly radioactive starting materials. The dangerous radioactivity of the source material also made it necessary to institute complicated remote control methods of operation to keep health hazards at a minimum.

These problems were solved after three years work. Americium for target material was prepared in milligram amounts by intense neutron bombardment of plutonium over a long period of time, and curium target materials were prepared in microgram amounts as the result of the intense neutron bombardment of some of this americium. Both of these neutron bombardments took place in high-flux reactors (i.e., reactors that deliver large concentrations of neutrons that can be used for transmutation purposes).

Element 97 was discovered by S. G. Thompson, Ghiorso, and me in December 1949 as the result of the bombardment of milligram quantities of  $^{241}_{95}\text{Am}$  with 35 MeV helium ions accelerated in the 60-inch cyclotron at Berkeley (14). The nuclear reaction was



The new nuclide was expected to have a short half-life and thus relatively rapid chemical separation techniques had to be employed. For this purpose cation-exchange was used.

The actual discovery experiments were not as simple as this description would indicate. During the fall of 1949 we made a number of bombardments of americium with helium ions in the 60-inch cyclotron, with emphasis on looking for alpha-particle emitting isotopes of element 97, all with negative results. It was becoming clear that we should look for electron capture decay by detecting the accompanying conversion electrons and X-rays so Ghiorso worked to improve the detection efficiency for such radiations.

The first successful experiment was performed on Monday, December 19, 1949. A target containing 7 milligrams of  $^{241}\text{Am}$  was bombarded with helium ions in the 60-inch cyclotron, after which the chemical separation was started at 10:00 a.m. After the removal of the bulk of the americium by two oxidation cycles (utilizing oxidation to the hexapositive, fluoride-soluble, oxidation state of americium, which had just been discovered by Asprey, Stephanou and Penneman at Los Alamos), the 97, Cm and remaining Am were carried on lanthanum fluoride, dissolved and subjected to a group separation from fission product lanthanide elements (using a method of elution with