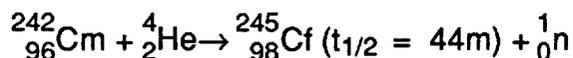


concentrated HC1, just discovered by Ken Street), after which the actinide fraction was put through a cation exchange adsorption-elution procedure; this entire process was completed in seven hours. The prediction that element 97 would elute ahead of Cm and Am, in sequence, was of course the key to its successful chemical identification. In this case, and especially in considering the data from following elution experiments, we were somewhat surprised to see the rather large gap between 97 and curium; we shouldn't have been surprised because there is a notably large gap between the elution peaks of the homologous lanthanide elements terbium and gadolinium.

Detected in the samples that eluted at the peak corresponding to element 97 were conversion electrons, X-rays of energy corresponding to decay by electron capture, and alpha particles at very low relative intensity (less than 1%). These radiations were found to decay with a half-life of about 4.5 hours, and it was immediately assumed that the isotope was $^{244}_{97}$ produced by the reaction: $^{241}_{97}\text{Am}(\alpha, n)^{244}_{97}$. Soon thereafter it was correctly surmised that the main isotope, that giving rise to the observed alpha particles, was actually $^{243}_{97}\text{Bk}$ produced by the reaction $^{241}_{97}\text{Am}(\alpha, 2n)^{243}_{97}\text{Bk}$.

It is interesting to note that experiments as early as the first day, i.e., Monday night, indicated that element 97 has two oxidation states, III and IV. The actinide concept provided the guidance to look for these two oxidation states, by analogy with the homologous element, terbium. In fact, the chemical identification procedure had been devised to accommodate either oxidation state and the large gap in the elution positions of element 97 and the curium was at first erroneously thought to be due to the fact that element 97 was in the IV oxidation state at that stage.

Element 98 was first produced and identified similarly by Thompson, K. Street, Jr., Ghiorso, and me (Figure 11), soon afterward in February of 1950, again at Berkeley (15). The first isotope produced is now assigned the mass number 245 and decays by alpha-particle emission and orbital electron capture with a half-life of 44 minutes. This isotope was produced by the bombardment of microgram amounts of $^{242}_{96}\text{Cm}$ with 35-MeV helium ions accelerated in the 60-inch cyclotron:



It is interesting to note that this identification of element 98 was accomplished with a total of only some 5,000 atoms; someone remarked at the time that this number was substantially smaller than the number of students attending the University of California.

The key to the discovery of element 98 was once again the use of ion-exchange techniques. On the basis of column calibration experiments, element 98 was expected to elute onto collection plate #13 in the 26th and 27th drops of eluant and this is exactly