

The discovery^{1,6,10} of the isotope Bk²⁴³ and measurement of the energies of its alpha-particles also provided the key to better predictions of the nuclear properties of the isotopes of element 98. By making use of these data to extend the systematics of alpha-radioactivity,³ it was possible to make improved estimates of the alpha-particle energies of the isotopes of element 98 and of other isotopes of element 97. These estimated alpha-particle energies could in turn be used to estimate the alpha-decay half-lives of the transcurium isotopes³ and also to calculate by closed decay cycles the total energies for electron capture or beta-decay. The electron capture disintegration energies then led to the estimation of half-lives for this mode of decay, using an empirical energy versus half-life relationship,¹² which, although very rough due to uncertainties in the degree of prohibition, was nevertheless very useful in attaining the half-life estimates. By means of these methods, it was estimated that the longest-lived isotope of element 98 that could be produced by the bombardment of the isotope Cm²⁴² with helium ions should be the isotope 98²⁴⁴ by the (α ,2n) reaction, with an anticipated half-life between 30 minutes and several hours and emitting alpha-particles with energy in the range 7.0 to 7.3 Mev.

The high energies of the alpha-particles emitted in the decay of the isotopes of the new element were expected to make possible a sensitive means for their detection. Such high energy alpha-particles are conveniently observed with great sensitivity and their energies measured by means of a differential alpha-energy pulse analyzer.¹³ In using our instrument in the most sensitive manner, it is necessary to limit the total amount of alpha-radioactivity in the sample examined

¹²S. G. Thompson, Phys. Rev. 76, 319 (1949).

¹³Ghiorso, Jaffey, Robinson, and Weissbourd, National Nuclear Energy Series, Plutonium Project Record, Vol. 14B, "The Transuranium Elements: Research Papers," Paper No. 16.7 (McGraw-Hill Book Co., Inc., New York, 1949).