

alpha-radioactivity as described in the introduction to this paper. The bombardment of Cm^{242} with 33-Mev helium ions is considered to produce directly only the following possible isotopes of element 98 in significant yield--namely, 98^{243} , 98^{244} , and 98^{245} . Of these, only 98^{244} is expected to have a half-life longer than one-half hour unless the electron capture decay is unusually highly forbidden. The observed alpha-particle energy and half-life fit the alpha-decay systematics³ very well for an even-even type nucleus (unforbidden decay) of the element with atomic number 98.

The cross section for the production of the new isotope is about $3 \times 10^{-27} \text{ cm}^2$, based on the observation of the alpha-particles alone. This value is typical of those obtained in the production of other transuranium elements by bombardment with helium ions of energy 30 to 40 Mev. This cross section is sufficiently large to indicate in itself that alpha-particle emission is the principle mode of decay. For example, an electron-capture-to-alpha-decay branching ratio of 10 would require a cross section higher by a factor of 10 than the above and thus a much higher reaction cross section for the (α, xn) reactions than has been observed previously for the production of transplutonium isotopes. It is believed, however, based on estimates using the systematics of radioactivity, that the isotope 98^{244} is unstable toward electron capture decay. Estimates based on the electron capture disintegration energy as determined from closed decay cycles involving estimated energies and on the very rough empirical relationship between half-life and disintegration energy¹² indicate that the half-life of 98^{244} for decay by electron capture should be somewhat longer than that for decay by alpha-emission and hence that the branching ratio toward electron capture decay is less than one.

It is interesting to note that the amount of element 98 which has been isolated has never exceeded a few thousand atoms in any of the bombardments to date.