there were only two methods of approach to the production of element 97. The first approach was through the bombardment of americium with helium ions or bombardment of curium with deuterons or helium ions. The second (not yet successful) was through intensive neutron irradiations of curium in order to eventually produce through successive (n,γ) reactions a curium isotope of mass sufficient to be unstable toward negative beta-particle decay and so produce an isotope of element 97.

Both methods were employed in attempting to observe element 97 and for each, different chemical procedures were used. Some of these procedures were designed to separate the new element in oxidation states greater than (III) and others were used on the assumption that element 97 existed in solution under most conditions in the tripositive oxidation state.

Although the broad assumptions made when the work was started were all correct, the experiments done prior to December, 1949 were unsuccessful for many reasons which may be grouped into three classes. First, the methods of predicting the properties of the new isotopes were relatively undeveloped and the experiments were never done with sufficient speed. The further development of the alpha-decay systematics[4] made it possible to estimate energies and half-lives for alpha-particle decay. The resulting estimated alpha-particle decay energies could be used in calculating by closed decay cycles the total energies for electron-capture decay or beta-particle decay. An empirical method of estimating electron-capture half-lives from disintegration energies was also developed[5] which, although very rough due to uncertainties in the degree of prohibition of this mode of decay in any given case, was very useful in making half-life estimates.

The second major difficulty was that of obtaining sufficiently large amounts of americium and curium as sources for the production of element 97. Eventually

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[4]Perlman, Ghiorso, and Seaborg, Phys. Rev. 77, 26 (1950).

[5]S. G. Thompson, Phys. Rev. 76, 319 (1949).