only if the radioactive characteristics were favorable. Complete identification would depend upon showing by radiochemical techniques that the radioactivity resided in an element with unique chemical properties, different from all other known elements. It was necessary, in order to plan the chemical identification experiments, to have some idea as to the chemical properties of element 96 and for this purpose advantage was taken of some predictions of its chemical properties. The chemical investigation of the heaviest known elements (atomic numbers 89-92 inclusive) and the more recently discovered neptunium and plutonium, has led to the view that the heavy elements constitute a new "rare-earth" series in which the 5f electron shell is being filled and which formally begins with thorium. On this basis it was expected that element 96 would have a very stable III oxidation state with higher states being formed with great difficulty, if at all. Thus the anticipated chemical properties to be utilized for the isolation of detectable amounts of this element were to be those of elements with the typical III oxidation state such as the rare earths. It was essential to have at hand from the beginning a means for the complete chemical separation of the new element from plutonium, since the alpha-activity due to this element would be less than 1 ppm of that due to plutonium.

1. Experimental

The plutonium targets for cyclotron bombardment were prepared by the evaporation of plutonium nitrate solutions on grooved platinum plates, followed by mild ignition to form plutonium oxide. These targets were then bombarded directly in the target chamber of the cyclotron. There were two such bombardments in the 60-inch cyclotron of the University of California at Berkeley, the first one employing helium ions of 32 Mev energy,