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THE NEW ELEMENT AMERICIUM (ATOMIC NUMBER 95)

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ABSTRACT

Several isotopes of the new element 95 have been produced and their radiations characterized. The chemical properties of this tripositive element are similar to those of the typical tripositive lanthanide rare-earth elements. Element 95 is different from the latter in the degree and rate of formation of certain compounds of the complex ion type, which makes possible the separation of element 95 from the lanthanide rare-earths.

The name americium (after the Americas) and the symbol Am are suggested for the element on the basis of its position as the sixth member of an actinide rare-earth series, analogous to europium, Eu, of the lanthanide series.

The isotopes found and studied in this work are: (1) Am^{241}, which decays by the emission of alpha-particles (energy-5.45 Mev) with a 510 ± 20 year half-life and is produced by the beta-decay of Pu^{241}, which, in turn, is produced by the (α,n) reaction on U^{238}; (2) Am^{242}, which decays by the emission of beta particles (ca. 0.8 Mev maximum energy) with a 17-hour half-life or, in another isomeric form, by branching decay with the emission of alpha-particles (energy unknown) and beta-particles (ca. 0.5 Mev maximum energy) in the ratio ca. 0.002 alpha-particles per beta-particle; both isomers are produced by neutron capture in Am^{241}; (3) Am^{239}, which undergoes branching decay, decaying (a) by orbital electron capture with a 12 hour half-life and emitting 0.285 Mev gamma rays and conversion electrons in addition to the characteristic x-rays and (b) by alpha particle emission (energy unknown) in the ratio ca. 0.001 alpha-particles per electron capture. This isotope is produced by the (d,2n) reaction on Pu^{239} and by the (α,2n) reaction on Np^{237}; (4) Am^{238}, which decays by orbital electron capture with a 50-hour half-life emitting 1.3-1.4 Mev gamma rays and conversion electrons in addition to the characteristic x-rays. Am^{238} is produced by the (d,3n) reaction on Pu^{239}, and by the (α,3n) reaction on Np^{237}.

1. Introduction

Isotopes of the element with atomic number 95 have been produced and identified in experiments carried out with material activated in sixty-inch cyclotron of the University of California. The target materials which have been successfully used in the production of these isotopes are U^{238}, Np^{237} and Pu^{239}. The energetic helium ion bombardment of U^{238} leads to the formation of plutonium isotopes of mass numbers