FRONTIERS OF CHEMISTRY FOR AMERICIUM AND CURIUM*

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ABSTRACT. The discoveries of americium and curium were made only after Seaborg had formulated his actinide concept in order to design the chemistry needed to separate them from irradiated ^{239}Pu targets. Their discoveries thus furnished the first clear-cut evidence that the series exists and justified Seaborg's bold assumption that even though Th and Pa appeared to presage a following 6d series, the pattern established by the periodic table after Cs and Ba would be repeated exactly after Fr and Ra. That is to say, a new 5f element rare earth series (the actinides) would follow Ac in the same way the 4f rare earth series (the lanthanides) follows La. The consequences of the resulting half-filled $5f^7$ shell at Cm were originally presented by Seaborg as a test of his hypothesis. Recent research is outlined that substantiates Seaborg's predictions in new and definitive ways.

Americium and curium are of historic importance in chemistry because the method used in their discovery by Seaborg, Ghiorso and coworkers furnished the first clear-cut evidence that the actinide series exists. And, as is evident in this Symposium, americium and curium are still furnishing insights into the systematics and the underlying electronic phenomena implied by the formulation of the periodic table on the basis of the actinide concept.

As everyone knows, scientists often assume the validity of some pattern when they set up their own experiments. In his first attempts to discover Am and Cm, Seaborg (1) made the reasonable assumption that the pattern of chemical properties set up by U, Np, and Pu would persist to elements 95 and 96. The nuclear reactions employed in these new element discovery experiments were the bombardment of plutonium-239 with alpha-particles to produce ^{242}Cm and with neutrons to produce ^{241}Pu which would then decay to ^{241}Am. The chemical separations of Am or Cm from the irradiated ^{239}Pu targets were then based on the idea that they

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