*** Name Origin:**

From America by analogy with europium.

*** Sources:**

Produced by bombarding plutonium with neutrons.

*** Uses:**

Americium-241 is currently used in smoke detectors.

*** Additional Notes:**

Americium was the fourth transuranium element to be discovered; the isotope ^{241}Am was identified by Seaborg, James, Morgan, and Ghiorso late in 1944 at the wartime Metallurgical Laboratory of the University of Chicago as the result of successive neutron capture reactions by plutonium isotopes in a nuclear reactor:

$$^{239}Pu(n,\gamma) \rightarrow ^{240}Pu(n,\gamma) \rightarrow ^{241}Pu \rightarrow \beta \rightarrow ^{241}Am$$

Since the isotope ^{241}Am can be prepared in relatively pure form by extraction as a decay product over a period of years from strongly neutronbombarded plutonium, ^{241}Pu, this isotope is used for much of the chemical investigation of this element. Better suited is the isotope ^{243}Am due to its longer half-life (7.37×10^3 years as compared to 432.2 years for ^{241}Am). A mixture of the isotopes ^{241}Am, ^{242}Am, and ^{243}Am can be prepared by intense neutron irradiation of ^{241}Am according to the reactions $^{241}Am(n,\gamma) \rightarrow ^{242}Am(n,\gamma) \rightarrow ^{243}Am$. Nearly isotopically pure ^{243}Am can be prepared by a sequence of neutron bombardments and chemical separations as follows: neutron bombardment of ^{241}Am yields ^{242}Pu by the reactions $^{241}Am(n,\gamma) \rightarrow ^{242}Am \rightarrow ^{242}Pu$, after chemical separation the ^{242}Pu can be transformed to ^{243}Am via the reactions $^{242}Pu(n,\gamma) \rightarrow ^{243}Pu \rightarrow ^{243}Am$, and the ^{243}Am can be chemically separated. Fairly pure ^{242}Pu can be prepared more simply by very intense neutron irradiation of ^{239}Pu as the result of successive neutroncapture reactions. Sixteen radioactive isotopes and isomers are now recognized. Americium metal has been prepared by reducing the trifluoride with barium vapor at 1000 to 1200°C or the dioxide by lanthanum metal. The luster of freshly prepared americium metal is white and more silvery than plutonium or neptunium prepared in the same manner. It appears to be more malleable than uranium or neptunium and tarnishes slowly in dry air at room temperature. Americium is thought to exist in two forms: an alpha form which has a double hexagonal close-packed structure and a loose-packed cubic beta form. Americium must be handled with great care to avoid personal contamination. As little as 0.03 mCi of ^{241}Am is the maximum permissible total body burden. The alpha activity from ^{241}Am is about three times that of radium. When gram quantities of ^{241}Am are handled, the intense gamma activity makes exposure a serious problem. Americium dioxide, AmO_2, is the most important oxide. AmF_3, AmF_4, $AmCl_3$, $AmBr_3$, AmI_3, and other compounds have been prepared. The isotope ^{241}Am has been used asa portable source for gamma radiography. It has also

been used as a radioactive glass thickness gage for the flat glass industry, and as a source of ionization for smoke detectors. Americum-243 is available from the Oak Ridge National Laboratory at a cost of $160/mg plus packing charges.