

**Separarion Of Plutonium And Americium Molten
 Salts Using A Chlorine Gas Stream**

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Work has begun on the development of a process to separate americium from plutonium in molten salt process residues. Removal of americium is important in that it presents a significant gamma radiation (~60Kev) exposure hazard. Aqueous processing is the current technique used for this separation. However, aqueous operations afford minimal intrinsic attenuation of the gamma radiation emitted by the americium, whereas equipment used in the molten salt processes allows for some inherent degree of shielding resulting in less exposure.

The molten salt separation is based on vapor pressure difference and can be accomplished using a flow of chlorine gas at elevated temperatures to enhance the volatility for PuCl₃. Since PuCl₃ will react with chlorine to form a gaseous PuCl₄ species, and there is no known americium tetrachloride, good separation can be achieved.

Experiments have been carried out to characterize the process using gram quantities of both pure plutonium trichloride, and mixed plutonium-americium salts. A picture of the reaction container with a mixed plutonium-americium chloride starting material is shown in Figure 1. Tests have resulted in deposition of plutonium trichloride in the reaction tube just before it exits the furnace, whereas americium remains in the reaction container in the center of the furnace. Preliminary results determined by comparing gamma radiation measurements before and after the separation process also indicate that the separation was successful (see Table 1). An increase in the gamma radiation level of 400-500% was found in the remaining residue (AmCl₃) while readings from the volatilized and the PuCl₃ were at background level. Powder x-ray diffraction and additional radiochemical results confirming successful separation will also be presented.

Table of Gamma Radiation Readings (mR/hr) for Three Separations

Boat + Feed	Boat Residue	PuCl ₃
140.0	700.0	0.5
	700.0	0.6
130.0	850.0	0.1

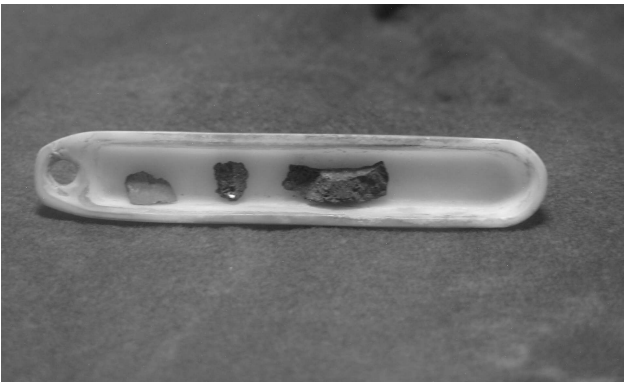


Figure 1. Gram quantities of mixed plutonium-americium chloride feed material in SiO₂ boat.