Microwave-assisted Decomposition of Environmental Samples Coupled to Classical Methods of Separation and Purification for the Analysis of $\text{Sr}^{90}$ and $\text{Pu}^{238,239}$.

Garcia, R., Rosson, R., and Kahn, B.
NE/HP program, School of Mechanical Engineering,
Georgia Institute of Technology, Atlanta, GA 30332

Traditional wet-ash methods employed in the analysis of environmental matrices are lengthy, require constant attention, and consume significant amounts of mineral acids. Microwave-assisted decomposition, an alternative to traditional methods, was investigated as a potential laboratory tool in the radiochemical analysis of soil, fish, and vegetation samples.

All samples were dry-ashed prior to the microwave decomposition step. One-gram replicate samples were decomposed with a commercial microwave-oven system. Acid volumes, concentration, and heating programs were varied systematically to determine optimum conditions. In the most favorable cases more than 99% of the sample mass was dissolved.

Analytical schemes were developed to analyze $\text{Sr}^{90}$ and $\text{Pu}^{238,239}$. These schemes coupled a microwave decomposition procedure with classical methods of separation and purification. Strontium carbonate carrier and $\text{Pu}^{242}$ tracer were used as yield monitors. Strontium-90 and $\text{Pu}^{238,239}$ were quantified by gross-$\beta$ counting and $\alpha$-spectrometry. Average yields of 75% or better were obtained. Detection limits of 0.7 pCi/g ($\text{Sr}^{90}$) and 0.05 pCi/g ($\text{Pu}^{238,239}$) were reached. Soil and vegetation samples spiked with $\text{Pu}^{238}$, and heated at 900°C for several hours, were analyzed. Results indicate that virtually all the plutonium (yield corrected) was recovered.