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

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