

## WASTE REDUCTION AND PROCESS IMPROVEMENTS IN THE ANALYSIS OF PLUTONIUM BY X-RAY FLUORESCENCE

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X-ray fluorescence (XRF) is an established method for quantifying gallium in plutonium metal.<sup>1</sup> The currently certified method entails dissolving the plutonium, removing it with ion exchange solid phase extraction (SPE), and quantifying the eluate for gallium content. Because disposing transuranic (TRU) waste is expensive, waste reduction in this process would substantially reduce costs as well as comply with environmental management waste minimization goals.

Several modifications were made to the XRF method presented here. The sample size was reduced by 50%, which decreased needed SPE acid volumes and resin by ~50%. Consequently, fewer TRU-contaminated acid containers needed to be disposed. Also, a pre-nitrated resin was used, which required approximately half the amount of nitric acid currently necessary to fully condition the resin.

In addition to these waste minimization practices, several additional cost savings and safety improvements were employed. Ultra high quality acid (ppt impurities) is used in the currently certified method for historical reasons, but considerably cheaper trace metal grade acid (ppb impurities) was used in the modified process. Toxic hydrofluoric acid is used in the current method for historical reasons but was eliminated in the modified process. Finally, Mylar specimen containment film was replaced with more robust Kapton to reduce the possibility of film rupture during analysis of the specimen. This tougher film was also necessary due to longer counting times required from reducing the sample size.

Multiple batches of previously well-characterized plutonium will be analyzed over time using this modified method, and accuracy and precision results will be presented.

1) C. G. Worley, *Advances in X-ray Analysis*, **2002**, 46, 369-374.