Do you have the correct alpha efficiency? Electrodeposition or micro-precipitation.

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The Dosimetry Services Group (DSG) at Oak Ridge National Laboratory (ORNL) performs routine in vitro radiobioassay analyses of actinides, fission products, and other analytes used by researchers and staff. The purpose of the routine program is to monitor radiological workers for potential occupational internal exposure in accordance with regulatory requirements.

When radiochemical separation is required to determine the activity of an actinide in a sample, it is necessary to account for the loss of analyte during the process. Therefore, a known amount of tracer is added at the beginning of the analysis, and the detector responses from the tracer and the analyte are compared to calculate the analyte activity in the sample. This calculation is straightforward as long as both the tracer and the analyte have the same decay mode (eg. alpha decay).

The DSG routinely analyzes for Th and Np by using beta emitting tracers, Th-234 and Np-239, respectively. Due to the different decay modes of the tracer and analyte, the final activity calculation involves the alpha detector efficiency, which must be determined accurately to obtain good results.

There are two major ways of preparing alpha counting sources, one is electrodeposition (ED) and the other is micro-precipitation (PPT). Naturally, the efficiency calibration source should be prepared in the same way as the actual samples are prepared, ie., ED or PPT.

In this talk, we will compare the alpha counting efficiencies of both source preparation methods. Also we will discuss what can be done when using different preparation methods for the calibration source and actual samples.