

## **A Rapid Screening Method for $^{241}\text{Am}$ in Urine Using a DIPEX Based Extractive Scintillator and PERALS Spectroscopy**

Robert L. Metzger and P.H. Pouquette  
Radiation Safety Engineering, Inc  
3245 North Washington Street  
Chandler, AZ 85225

Rapid methods that can identify patients that have been exposed to airborne concentrations of actinides in excess of one Annual Limit of Intake (ALI), and can return results in a clinically usable time frame are needed. The methods should be usable in a portable laboratory stationed near a hospital, or, preferably in the hospital itself, and be able to handle high sample volume. A method that meets these criteria has been developed and tested for  $^{241}\text{Am}$ .

Fifty milliliters of raw urine was decolorized using an Amberchrome pre-filter material<sup>1</sup>. Hydrochloric acid was stirred into the sample until it was 0.1M in HCl, and ascorbic acid and a defoaming agent were added. Two milliliters of an extractive scintillator consisting of 5 grams/liter DIPEX<sup>1</sup> in Ultima-Gold F<sup>2</sup> was then added and the mixture was equilibrated in a teflon separatory funnel for five minutes. The phases were allowed to separate for ten minutes and the top layer of the aqueous and organic phases were removed and centrifuged for five minutes to complete the phase separation. One milliliter of the extractive scintillator was removed, sparged with dry argon, and counted for ten minutes in a PERALS<sup>3</sup> spectrometer. The time spectrum was monitored for each sample to ensure good separation of the beta-gamma pulses from the alpha pulses. The average recovery for spiked samples exceeded 85%, and the lower limit of detection was 0.22 Bq/L (6 pCi/L) of urine. This LLD is well below the expected urine concentration one day after an inhalation intake of 1 ALI of Class M  $^{241}\text{Am}$  (5  $\mu\text{m}$  AMAD assumed).

The time required for the sample preparation, extraction, and counting was under two hours and the procedure is suitable for batch processing.

---

<sup>1</sup>Eichrom Technologies, LLC, 1955 University Lane, Lisle, IL 60532

<sup>2</sup>Perkin Elmer, Inc, 2200 Warrenville Road, Downers Grove, IL 60515

<sup>3</sup>Ordela, Inc., 1009 Alvin Weinberg Drive, Oak Ridge, TN 37830