Rapid Pu Urinalysis Method by Flow Injection Detection System

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Bioassay is a useful monitoring method for intakes of plutonium. An analysis method of plutonium in a urine sample usually requires rigid chemical separation. Generally, ion exchange and/or extraction methods are used for the isolation of plutonium from matrix substances in urine. To reduce the time required for the urinalysis of plutonium, an automatic on-line detection method has been developed. In the present development, a flow injection technique of chromatography was applied to the isolation of plutonium and ICP-MS was utilized for the detection. A currently developed flow injection detection system, as shown in Figure 1, consists of separation and detection modules. The separation module includes two extraction chromatography columns (UTEVA and TRU resins, Eichrom Technologies

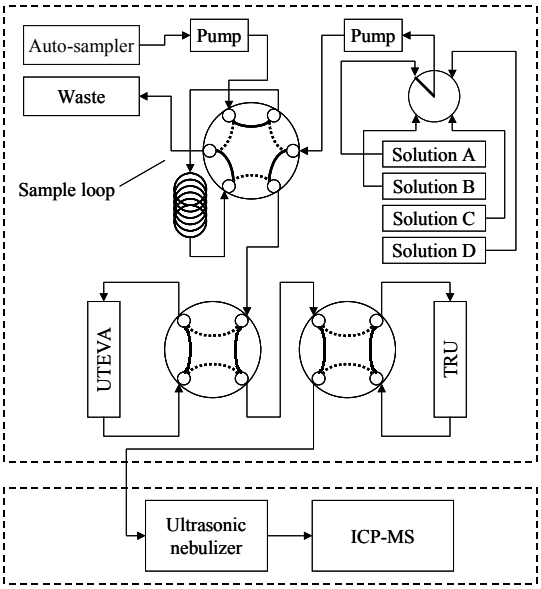

Figure 1 Schematic diagram of the flow injection detection system.

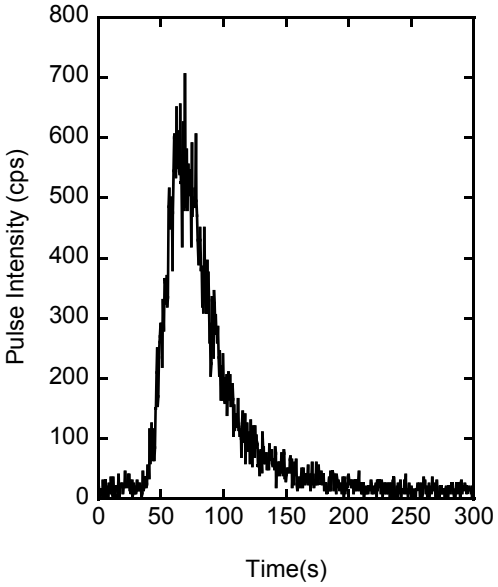

Figure 2 Elution profile of ^{239}Pu.

Inc.), which allow to isolate plutonium and other actinides sequentially. For the test measurement, several urine samples (750ml each) were spiked with 0.1 Bq of ^{239}Pu and then were treated by co-precipitation and microwave digestion. Digested samples adjusted to 25 ml volume were used for ^{239}Pu measurement by the flow injection detection system. The elution profile of ^{239}Pu from a UTEVA resin is shown in Figure 2. The time required for the separation was about 20 minutes per sample.