1-9 Toward Engineering Scale Minor Actinides Recovery –Development of Extraction Chromatography Techniques–

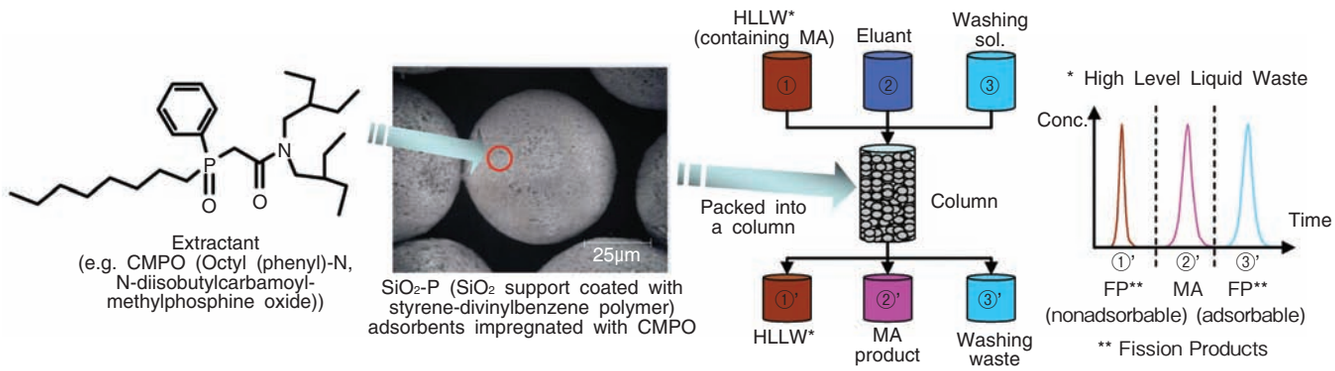

Fig.1-27 MA recovery by extraction chromatography
SiO_2-P adsorbent material impregnated with an extractant is packed into a column. Solution containing MA (①) is fed into this column, and MA is adsorbed. The adsorbed MA is eluted by a suitable eluant (②), and recovered into a solution (②'). Several columns with different adsorbents (extractants) may be used for better separation of MA from other elements.

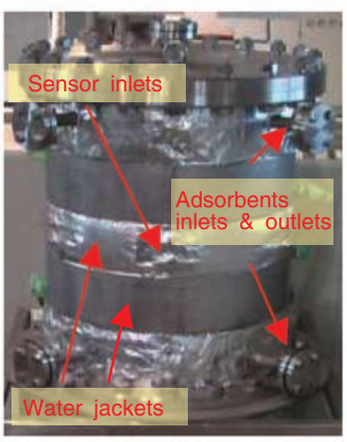

Fig.1-28 Engineering scale column
Stainless steel column with 48cm inner diameter, which has water jackets for temperature control and sensor inlets for experiments.

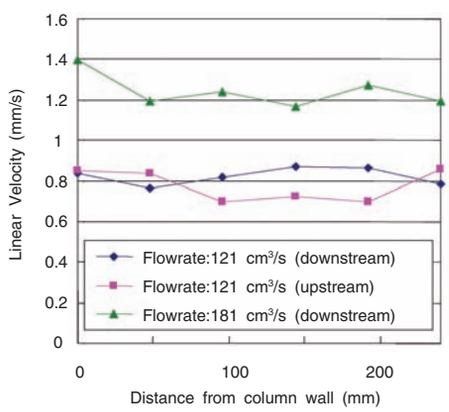

Fig.1-29 Linear velocity in a column
The uniform flow through a column with 48cm diameter can be obtained with flow of 121cm³/s (downstream).
About 1.7kg of MA is supported to be recovered in this flowrate condition.

Studies on minor actinide (MA) recovery by solvent extraction have been carried out in several countries. These processes use extractants with diluents, which cause various kinds of liquid waste in large amounts. In the extraction chromatography technique, in which extractants are impregnated into support particles, no diluent is used, and higher MA loading can be achieved, so this is potentially more economical. We developed a process and system of MA recovery by extraction chromatography which can be expanded to an engineering scale.

We selected a SiO_2 support coated with styrene-divinylbenzene polymer (SiO_2-P) (Fig.1-27), which has superior safety and handling properties, and started assessing SiO_2-P adsorbent materials impregnated with several kinds of extractants, e.g. CMPO; adsorption/elution of MA, acid and radiation resistance, and ease of after-treatment of these adsorbents. These properties are now being measured, and several process flows for MA recovery will be designed and evaluated based on these data.

In our development of an engineering scale system, we fabricated an engineering scale column system (Fig.1-28) and have been investigating the fluidics and thermal control properties in actual operation, and the durability through long-term operation. Through these investigations, we determined the operational conditions necessary for uniform flow through the column, which is indispensable for steady MA recovery (Fig.1-29).

We also investigated remote control and instrumentation for the column operation, and we will have overall assessments of separation performance, safety, instrumentation and control, and remote handling based on these results and engineering scale experiments.

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Reference

Koma, Y., Watanabe, S., Sano, Y. et al., Extraction Chromatography for Am and Cm Recovery in Engineering Scale, Proceedings of 3rd International ATALANTE Conference (ATALANTE 2008), Montpellier, France, 2008, O1-19, p.8, in CD-ROM.