

TXRF analysis for the screening of uranium surface contamination on demolition debris with sample condensation technique

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Demolition debris that may have been contaminated with uranium on the surface will be found at the decommissioning field of the Fukushima Daiichi Nuclear Power Plant in the near future. Since the specific activity of uranium is extremely low, it is difficult to detect uranium on the surface of debris by radiation measurement. On the other hand, we have reported that total reflection X-ray fluorescence (TXRF) analysis is useful to detect uranium in water [1-2], and sample condensation can increase the detection sensitivity [3]. Therefore, it is likely that TXRF analysis of condensed acid elution solution of demolition debris could be used to evaluate uranium surface contamination on demolition debris with high sensitivity. In this study, we developed a methodology for screening uranium surface contamination on demolition debris using TXRF analysis and sample condensation technique. As a model of surface shavings of contaminated demolition debris, a dilution series of uranium containing multi-element standard solution was placed on crushed concrete/soil mixtures and dried. Subsequently, nitric acid solution was added to the samples and shaken. After filtration, chromatography resin separation was performed. A portion of sample solution was completely dried and dried residue was eluted by a volume of eluting solution smaller than the original. An aliquot of the sample solution was dropped onto the fluorine-coated quartz glass and dried. As a result of TXRF analysis of these samples, it was shown that even with a small amount of contaminated debris, measurement with sufficient sensitivity is possible. This research project was conducted as a regulatory supporting research funded by the Secretariat of Nuclear Regulation Authority (S/NRA/R) in Japan.

References

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