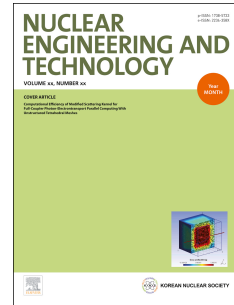


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Original paper

**Accurate determination of minor isotope ratios in individual plutonium-uranium mixed particles by thermal ionization mass spectrometry**

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Abstract

Isotopic analyses of plutonium and low-enrichment uranium mixtures with particle sizes of 0.6-3.3  $\mu\text{m}$  were performed using thermal ionization mass spectrometry with a continuous heating method to verify its effectiveness for the accurate analysis of minor isotopes without sample pretreatment. The mixed particles used in this study were prepared from a mixed solution of plutonium (SRM 947) and uranium (U010,  $^{235}\text{U}$  1% enriched) reference materials. The isotope ratios for plutonium in the individual mixed particles, including  $^{238}\text{Pu}/^{239}\text{Pu}$ ,  $^{241}\text{Pu}/^{239}\text{Pu}$  as well as  $^{240}\text{Pu}/^{239}\text{Pu}$ , and  $^{242}\text{Pu}/^{239}\text{Pu}$ , were in good agreement with the certified values despite the isobaric interference of  $^{238}\text{U}$  and  $^{241}\text{Am}$ . The isotope ratios for uranium in the mixed particles also agreed well with the certified values within the range of error. However, the isotope ratios for minor isotopes, such as  $^{234}\text{U}$  and  $^{236}\text{U}$ , in the particles with diameters of less than approximately 1.8  $\mu\text{m}$  could not be measured because numbers of  $^{234}\text{U}$  and  $^{236}\text{U}$  atoms in analyzed particles are too low. These results indicate that thermal ionization mass spectrometry with a continuous heating method is applicable for the analysis of trace amounts of plutonium isotopes, including  $^{238}\text{Pu}$  and  $^{241}\text{Pu}$ , despite the presence of the respective isobars  $^{238}\text{U}$  and  $^{241}\text{Am}$  in the micro-samples.

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