Contribution ID: **357** Type: **Wedge Participant**

Isotopic analysis of U-Pu mixed particles using Large-Geometry Secondary Ion Mass Spectrometry (LG-SIMS)

In line with the strategic plan of the Department of Safeguards, the Office of Safeguards Analytical Services (SGAS) was given the task to prepare for new verification challenges by expanding its contribution to the Environmental Sampling Programme in the area of particle analysis. Since 2010, the LG-SIMS technique has been implemented by SGAS to perform particle isotopic measurements that contribute exclusively to verify the completeness of Member States'declarations regarding nuclear materials and activities relevant to the uranium fuel cycle.

In 2017-2018, a feasibility and development study was carried out by SGAS to demonstrate a new method based on LG-SIMS for the determination of U and Pu isotopic and elemental abundances in mixed particles. An original approach was followed with the view to minimizing the time required to switch between standard and modified instrumental configuration (U only vs U and Pu isotopes).

A range of reference materials in the form of fuel-grade, pure PuO2 (NBL CRM 122 and CRM 136) and reactor-grade, mixed U-Pu oxide (UKMOX10) particles were used to calibrate and test the method. It was then applied to weapon-grade, mixed U-Pu oxide particles originating from the Thule accident (Greenland, 1968) and from the Trinity test (USA, 1945). Results were compared to the literature. A field Environmental Sample containing around 200 pg of Pu was eventually analysed by LG-SIMS and results were compared to those reported by the IAEA's Network of Analytical Laboratories (NWAL) using the reference technique for particle analysis for U and Pu isotopes based on Fission-Tracks combined to Thermo-Ionisation Mass Spectrometry (FT-TIMS).

The main limitation of the developed method appeared to be related to the substantial formation rate of U-238 hydride ions during the process of secondary ionization of U-238 that may compromise the determination of Pu-239 for mixed particle with U/Pu above 20. Potential approaches to correct for hydride interference as well advantages and drawbacks of the method will be further discussed.

Which "Key Question" does your Abstract address?

SGI1.1

Which alternative "Key Question" does your Abstract address? (if any)

Topics

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