Contribution ID: **14** Type: **oral**

Implementation of Mass Spectrometry for Bulk Analysis of Environmental and Nuclear Material Inspection Samples

Tuesday, 21 October 2014 14:10 (20 minutes)

In the frame of the ECAS project (Enhancing Capabilities of Safeguards Analytical Services) the IAEA Office of Safeguards Analytical Services has implemented the latest-generation inductively coupled plasma mass spectrometers, or ICP-MS, for (i) bulk analysis of uranium and plutonium isotopes in environmental inspection samples and (ii) impurity analyses in uranium samples. The measurement accuracy for n(U-235)/n(U-238) ratios has been improved by ca. Five times with the new multi-collector ICP-MS equipment. Use of modern ICP-MS enabled also an improvement of instrumental detection limits for U-233 and U-236 and Pu isotopes by at least one order of magnitude in comparison to the values, which had been achieved with the previously used methods. The improved accuracy and precision for isotope ratio measurements is mainly due to the higher sensitivity and the possibility to simultaneously detect several U isotopes with a multi-collector detector block. Implementation of the ICP-MS has also demonstrated a possibility for an increased sample throughput. In parallel to the implementation of the ICP-MS, a new version of the "modified total evaporation"(MTE) method has been developed for isotopic analysis of uranium samples by multi-collector thermal ionization mass spectrometry (TIMS). The MTE method provides a measurement performance which is, in particular for minor uranium isotopes, by several orders of magnitude superior compared to the commonly used "total evaporation"method. The new mass spectrometric techniques significantly improve the capability of the IAEA safeguards laboratories to detect the presence of non-natural uranium and plutonium isotopes in environmental swipe samples and to identify previously imperceptible differences in nuclear "signatures". Thus, they enhance the IAEA's ability to obtain independent, timely and quality-assured safeguards-relevant data and ensure that important nuclear and chemical signatures are identified.

Country or International Organization

International Atomic Energy Agency

EPR Number (required for all IAEA-SG staff)

662

Primary author: BULYHA, Siarhei (Department of Safeguards, International Atomic Energy Agency, Vienna International Centre, PO Box 100, 1400 Vienna, Austria)

Co-authors: CUNNINGHAM, Alan (International Atomic Energy Agency); KOEPF, Andreas (International Atomic Energy Agency); POTHS, Jane (International Atomic Energy Agency); MACSIK, Zsuzsanna (International Atomic Energy Agency)

Presenter: BULYHA, Siarhei (Department of Safeguards, International Atomic Energy Agency, Vienna International Centre, PO Box 100, 1400 Vienna, Austria)

Session Classification: State of the Art Destructive Analysis