Building Future Safeguards Capabilities
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SIMS application to determination of the age of uranium materials on the results of microparticle analysis

The Age of uranium materials (time after the last purification) is one of characteristics, which may be determined for Safeguards goals [1]. Reliable techniques are developed now for determination of the age of these materials by using ICP-MS [2]. But the results of bulk method, are correct only if the microparticles of one uranium material are present in analyzed sample and consequently in sample preparation.

Verification results of the age determination by bulk analysis can be provided by using SIMS. The purpose of this work is estimation of the SIMS measurements ability to distinguish two different uranium materials with different manufacturing dates in one sample by using measurements of ion currents of thorium 230 to uranium 234.

In this work ratio of ion currents of thorium-230 and uranium-234 was measured in fragments of fuel pellet, which was made by mixing two materials –depleted uranium and low enriched uranium. ICP-MS analysis of this ratio shows the sample heterogeneity: results of different fragments measurements were different and were in the range from 9×10-6 to 1.1×10-5. According to these results it became apparent, that each of two components has its own value of thorium-230 to uranium-234 ion currents ratio. Therefore comprehensive characterization of the sample requires determination each of component.

Cameca IMS-1280 with multicollector was used for this purpose. The ratio of thorium-230 to uranium-234 ion currents was estimated for microparticles in size range from 3 μm to 10 μm. Two groups of results were identified. First group contained particles of low enriched uranium. It was characterized by ratios from 1×10-5 to 9×10-5. Second one contained particles of depleted uranium, this group was characterized by ratios from 3×10-4 to 5×10-4.

References:

1\. G. Tamborini, Doctorate Thesis, University of Paris, 1998
2\. Z. Varga, G. Surranyi. Production date determination of uranium-oxide materials by inductively coupled plasma mass spectrometry// Analytica Chimica Acta 599, 2007, p.p. 16-23

Which "Key Question" does your Abstract address?

TEC1.1

Topics

TEC1

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

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