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Ultra Trace Determination of Minor Actinides by Laser Mass Spectrometry

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Klaus Wendt

Institute of Physics, Johannes Gutenberg-University Mainz, D-55099 Mainz, Germany

E-mail: Klaus.Wendt@uni-mainz.de

Plutonium and the so-called minor actinides Neptunium, Americium, Curium, Berkelium and Californium are considered to be within the most dangerous radiotoxic elements on earth. They are produced in rather large quantities in nuclear reactors, during nuclear explosions and in accidents and their unambiguous and sensitive radiometric detection is often hampered by background or interferences in their α decay spectra. Apart of their radiotoxicity in the environment they also serve as highly sensitive tracers for dedicated geological, astrophysical and increasingly also bio-medical studies.

To form a very sensitive and highly selective technique, multi-step resonant laser ionization using tunable lasers is coupled to well adapted mass spectrometric devices. Full suppression of isobaric interferences, resolution of isotopic composition and the high ionization efficiency of these resonance ionization mass spectrometers (RIMS) ensures lowest detection limits and significance of the results. E.g. for Pu, isotope content and composition in environmental samples with LODs as low as 105 atoms, corresponding to activity levels in the μBq range, are reported.

K. Wendt, N. Trautmann, *Int. J. Mass Spectrom.* 242, 161 (2005)

Presenters: WENDT, Klaus (University of Mainz); RAEDER, Sebastian (GSI)