Improving the Accuracy and Precision of Large Isotope Ratio Determinations Using High Sensitivity ICP-MS

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For isotope ratio determinations in principle three instrumental ICP-MS solutions exist: Quadrupole based ICP-MS, single collector magnetic sector field ICP-MS and multicollector magnetic sector field ICP-MS. General assumption is that precision and accuracy for isotope ratio measurements increases with complexity of technology used. The work will describe the achievements in isotope ratio analysis by a high performance quadrupole based ICP-MS.

Key characteristic is a very high ion transmission achieved by an optimized interface, and a unique ion optical system with low chromatic and spherical aberrations, which focuses ions into one focal point. In result isotope concentrations in the single digit pg/L range can be determined – allowing the precise determination of the minor isotopes in isotopes systems like Uranium, Uranium/Lead and Thorium.

The sensitivity of an ICP-MS is an indispensable performance characteristic: high sensitivity is on one hand important to measure isotope ratios with high precision despite of low concentrations, and/or to measure large isotope ratios to achieve high precision for low abundant isotopes. Beside that the abundance sensitivity is an important parameter for the accuracy of isotope ratio determinations. This is especially important for minor isotopes in the presence of neighboring intense ion beams.

The presentation will discuss the figures of merit of a high sensitivity quadrupole ICP-MS for isotope ratio determinations.