

Improving sensitivity of trace element analysis with the Jet Interface

HAUKE VOLLSTAEDT¹, LAURA BRACCIALI¹, CLAUDIA BOUMAN¹, SOREN H DALBY² AND MARIO TUTHORN¹

¹Thermo Fisher Scientific (Bremen) GmbH

²Thermo Fisher Scientific (Denmark)

Sector field, single collector inductively coupled mass spectrometry is a powerful and versatile established technique which is used for a wide range of trace elemental and isotope ratio applications in wet and dry plasma. Mass and signal stability, scanning speed, high sensitivity and low elemental backgrounds are key parameters which determine the final quality of the measurement. The Jet Interface, consisting of specially designed cones and a high-capacity interface pump, sets the highest standard for sensitivity in elemental analysis and comes as a standard setup for all Thermo Scientific™ Element™ Series HR-ICP-MS.

Here we present isotope ratio measurements of natural uranium (IRMM-184) using an Element™ XR HR-ICP-MS with a standard and Jet Interface set-up in wet plasma mode. The $^{234}\text{U}/^{238}\text{U}$ and $^{235}\text{U}/^{238}\text{U}$ were mass bias corrected by an external standard (NIST U010). Results indicate accurate $^{234}\text{U}/^{238}\text{U}$ and $^{235}\text{U}/^{238}\text{U}$ ratios with a precision level of 0.17% (RSD) and 0.04% (RSD) at 100 ppb U concentrations using the Jet Interface which represents a factor ~1.5 improvement in precision mainly derived from enhanced minor isotope signals. We further present data for 10 ppb U concentrations using the Jet Interface set-up.

The results from this study indicate that the integrated Jet Interface setup in the Element Series HR-ICP-MS significantly improves isotope ratio precisions. The enhanced sensitivity may be utilized for investigating lower U concentrations when sample amount is limited or radioactive exposure should be minimized.