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Improvements in TIMS high precision isotope ratio measurements for very small samples.

D. Tuttas, J. Schwieters, N. Quaas

Thermo Electron (Bremen) GmbH, Hanna-Kunath-Str.11, 28199 Bremen, Germany, (dietmar.tuttas@thermo.com)

Thermal Ionization Mass Spectrometry (TIMS) is an established technique for high precision isotope ratio measurements. Because of its extremely high ionization efficiency for some elements like Sr, Nd, Os and clean spectral backgrounds the TIMS technique is a powerful method for the analysis of extremely small sample sizes. For the analysis of ultra small sample sizes in the pg range the noise of the Faraday detectors is the major limitation for high precision measurements. Usually the current amplifiers are equipped with a 10^{11} Ohm feedback resistor and the Johnson noise generated in the resistor limits the attainable precision. Of course multi-ion-counting could ideally resolve the noise issue, but here we see other limitations like proper cross calibration of the ion counters, linearity and stability. The attainable precision with multi-ion-counting maybe limited to the range of about 1 permil precision, which is not good enough for many geological applications.

In this study we aim to narrow the gap between ion counting and Faraday cup measurements by using a set of current amplifiers with a 10 fold increased feedback resistor (10^{12} Ohm). This promises to improve the signal/noise by a factor of 2-3. Neodymium isotope measurements with signal intensities in the range of 50 mV down to 1 mV are shown to demonstrate the improvements.