Effect of oxide formation on the accuracy of Nd isotopic ratios measurements in MC-ICP-MS

E. FRÈRES[1]*, D. WEIS[1], K. NEWMAN[2], M. AMINI[1] AND K. GORDON[1]

[1] Pacific Centre for Isotopic and Geochemical Research, University of British Columbia, Vancouver, BC, V6T 1Z4, Canada (*correspondence: emfreres@eos.ubc.ca)

[2] Water Quality Center, Trent University, Peterborough, ON, K9J 7B8, Canada

Isotopic ratios can be measured with ppm levels of precision using MC-ICP-MS. The measurement of accurate isotope ratios depends on the adequate correction of the instrumental mass bias. The origin of this bias is element dependent and not fully understood. Previous studies [1,2] document that an increased oxide formation rate for Nd can yield a non-linear mass dependent component to mass bias that cannot be corrected using standard mass bias models and can compromise the accuracy of the corrected ratios.

We investigated the effects of changing the instrument operating conditions, sample introduction system, and sampler/ skimmer cones' geometry on the formation of NdO^+ species. The most relevant parameters to oxide formation are torch position, nebulizer pressure, sample gas flow, and skimmer geometry. Varying these parameters allowed us to map how Nd isotopic ratios are affected by oxide formation. The general trend for ^{142}Nd, ^{143}Nd and ^{145}Nd /^{144}Nd ratios is that increasing oxides cause the ratios to decrease, while ^{148}Nd/^{144}Nd ratios increase (e.g. Table 1). The rate of oxide formation for Nd was found to be isotope dependent.

^{144}Nd^{16}O/^{144}Nd (%)	^{143}Nd/^{144}Nd	^{148}Nd/^{144}Nd
Reference Value	0.512116	0.241572
0.11	0.512048 (15)	0.241410 (18)
0.15	0.512063 (10)	0.241538 (2)
0.3	0.512028 (9)	0.241541 (3)
0.6	0.511987 (18)	0.241560 (11)

Table 1. ^{143}Nd and ^{148}Nd /^{144}Nd (2SD*10^6) measured on JNdi using high sensitivity cones and an Aridus II spray chamber

The limitations of the exponential law to correct for instrumental mass bias over the relatively large mass range of Nd, and other factors that might affect the accuracy of Nd ratio measurements are being investigated. Collectively, these results allow us to elucidate the effects of various paramters on instrumental mass bias and hence to develop a new set of operating conditions that minimize oxide formation without compromising sensitivity and give the most accurate ratios.

[1] Newman *et al.* (2009) *J. Anal. Atom. Spectrom.* **24**, 742-751. [2] Newman (2012) *J. Anal. Atom. Spectrom.* **27**, 63-70.