# Optimizing precision in $^{142}$Nd TIMS analysis: Faraday cup performance

M.F Horan[1*], R.W. Carlson[1]

Dept. of Terrestrial Magnetism, Carnegie Institution for Science (correspondence: *mhoran@carnegiescience.edu, rcarlson@carnegiescience.edu)

To resolve variation in 142Nd/144Nd ratios of modern rocks, precisions of a few ppm must be achieved. To optimise analysis by thermal ionization mass spectrometry (TIMS), these steps are useful: 1) Interference-free and high recovery chemical purification that yields a Nd fraction having low amounts of organic residue. 2) For more uniform ionization and mass fractionation, 700 ng of Nd sample or standard is loaded onto a small amount of diluted $H_3PO_4$ on a Re filament. 3) Each cycle of our Thermo Triton analysis program provides four 142Nd/144Nd ratios collected in static mode from which two 142Nd/144Nd dynamic ratios are calculated; each analysis consists of 800-900 cycles. 4) Dynamic ratios are calculated and corrected offline for instrumental mass fractionation using drift-corrected 146Nd/144Nd and an exponential law.

Here we consider the effect of changes in Faraday cup efficiencies on the precision of Nd isotope ratios of the standard JNdi measured in both static and dynamic modes. Over a two-year period, Nd data were obtained with different collector sets, including with old graphite liners in the 9 Faraday cups, with a full set of new liners, and with cleaned but previously used liners. For sets of analyses done while the liners remained the same, average static 142Nd/144Nd ratios, corrected for mass fractionation, typically have 2σ of ± 15-45 ppm, but the averages between different static steps can differ from each other well outside of 2σ. With liner aging, static data arrays skew towards 142Nd/144Nd that are up to 100 ppm higher than that measured in dynamic mode. This skew dominantly results from decreased collection efficiency in the Faraday cup in which 144Nd is collected. By contrast, for calculated dynamic 142Nd/144Nd ratios, differing Faraday cup collection efficiencies mathematically cancel out, and therefore provide higher precision data over longer time intervals and with different collector sets. The long term 2σ of 143Nd/144Nd and 145Nd/144Nd measured in dynamic mode are smaller than those of 142Nd/144Nd, despite the lower natural abundances of 143Nd and 145Nd. We note that the magnitude of the fractionation correction is smaller for 143Nd/144Nd and 145Nd/144Nd because they are 1 amu apart, compared to 142Nd/144Nd. This contrast suggests that, for highest precision work, there may be a small component of non-exponential mass fractionation.

**This abstract is too long to be accepted for publication. Please revise it so that it fits into the column on one page.**

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