High-precision Tungsten isotope analyses by multicollection N-TIMS

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The lithophile-siderophile ^{182}Hf-^{182}W decay pair is well-suited for constraining the timing of planetary core-formation events by coupling the isotopic growth of ^{182}W resulting from the decay of ^{182}Hf ($T_{1/2}$ = 8.9 Myr) and elemental Hf/W ratios. In addition, the presence of late-accretion extraterrestrial and/or core-derived materials can be detected through high-precision analyses down to the ppm-level [1]. High-precision Tungsten isotope analyses by MC-ICP-MS [2] are now challenged by N-TIMS analyses that yield a long-term reproducibility of 5 ppm on ^{182}W/^{184}W [1]. However, a residual correlation has been observed between mass fractionation corrected ^{182}W/^{184}W and ^{183}W/^{184}W that has been attributed to mass dependent variability of O isotopes during analysis and from run to run, thus causing some inacurracy in W and Re oxide correction.

The present study on a Thermo Scientific TRITON *Plus* is aimed at investigating the residual mass bias correlation further by monitoring ^{18}O/^{16}O during W isotopic analysis so as to provide an in-run correction of W and Re oxides. Sample loads of 3 μg were run for > 820 cycles of 8 s integration at average ^{182}W^{16}O$_3$ signals of 0.6-3.5V in single static mode, using 10^{11} Ω amplifiers on W and Re oxide beams, with rotation of the amplifier-cup association (to average out amplifier gain biases). ^{186}W^{18}O^{16}O$_2$ beams of 4-10mV were measured with 10^{13} Ω or 10^{12} Ω amplifier for highly precise and accurate ^{18}O/^{16}O ratios deterrmination. Data are corrected for W and Re oxide interferences by using the measured ^{18}O/^{16}O ratios, and for instrumental mass fractionation, by normalizing to ^{186}W/^{184}W or ^{186}W/^{183}W. The internal precision on ^{182}W/^{184}W and ^{183}W/^{184}W normalized to ^{186}W/^{184}W is 3-8ppm (2RSE). External reproducibility is 17ppm and 12 ppm (2RSD). The internal precision on ^{182}W/^{183}W and ^{184}W/^{183}W normalized to ^{186}W/^{183}W is 2-8ppm (2RSE). External reproducibility is 15ppm and 8 ppm (2RSD). The preliminary data do not seem affected by secondary residual mass bias and have not been doubly normalized [1]. Further analyses will allow assessment of how determination of ^{18}O/^{16}O in samples will allow for improvement of long-term reproducibility.

[1] Touboul and Walker (2012) *Int.J.Mass Spectrom.* **309**, 109-117 [2] Holst *et al* (2013) *PNAS* **110**, 8819-8823