High precision tungsten isotopic measurement by NTIMS with in-run measured $^{18}O/^{16}O$ for isobaric oxide corrections

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^{182}Hf-^{182}W isotopic system has been widely used for constraining the timing of core formation and other early planetary differentiation processes. In this study, a high precision method for W isotopic analysis as WO_3^- by Negative Thermal Ionization Mass Spectrometry (NTIMS) was presented. A TRITON Plus TIMS was used for the measurement by using single Re filaments with La and Gd oxides as ionization enhancers. A cup configuration was set up to allow a two-line data acquisition protocol to eliminate the cup biases and measure the $^{18}O/^{16}O$ in-run with the equation $^{18}O/^{16}O = 1/3 \times (I_{236}/I_{234})$. In the equation, I_{236} and I_{234} refer to the ion beam intensities of $^{186}W^{16}O_2{}^{18}O^-$ (mass 236) and $^{186}W^{16}O_3^-$ (mass 234), respectively.

The $^{17}O/^{16}O$ was obtained from the measured $^{18}O/^{16}O$ with the equation $^{17}O/^{16}O = 0.1021948 \times {}^{18}O/^{16}O + 0.0001795$, which is based on long-term in-run measurements of $^{17}O/^{16}O$ and $^{18}O/^{16}O$ during NTIMS Os isotopic analysis as OsO_3^- (Chu et al., 2015).

NIST 3163 W standard was repeatedly measured to test the accuracy and reproducibility of our method. For each analysis, the sample load sizes were 1 – 2 μg of W and 700 – 1200 cycles of data were acquired with a ~ 1 V of $^{182}W^{16}O_3^-$ (mass 230) ion beam throughout. The mean $^{182}W/^{184}W$ result normalized to $^{186}W/^{184}W = 0.92767$ (Touboul and Walker, 2012) was 0.864899 ± 0.000003 (2SD, n = 13 of 15), which agreed well with the reported mean $^{182}W/^{184}W$ values of SPEX CertiPrep W (Trinquier et al., 2016) and Alfa Aesear W (Archer et al., 2017).

References:

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