Ti-Zr(Hf)-W separation by TODGA resin: application to high precision W isotope analysis by NTIMS

ZHUYIN CHU[1], JUNJIE XU[1], WEI WANG[1], MENGJIE WANG[1], CHAOFENG LI[1], YANG YUEHENG[1] AND JINGHUI GUO[1]

[1] Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China (*correspondence: zhychu@mail.iggcas.ac.cn)

^{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 new chromatographic method for isolation of W from geological samples for ultra-high precsion isotopic analysis was developed.

After the digestion of samples by HF-HNO_3, the samples were repeatedly treated with HNO_3-H_2O_2 and 6 M HCl. Finally, the samples were dissolved in 0.5M HCl-0.5M HF. The sample solutions were loaded onto anion exchange columns packed with 10 mL AG1-X8 100-200 mesh resins for separation of Ti-Zr-Hf-W collectively from sample matrix. The matrix elements such as Fe, Ca, Mg, Al, Na, K were eluted wuth 0.5M HCl-0.5M HF, and then the Ti, Zr, Hf and W were recovered with 7M HCl-2M HF. The Ti-Zr-Hf-W collections were dried down and re-dissolved with 8M HCl-0.01M HF. Then, the sample solutions were loaded onto extraction chromatographic columns packed with 0.6 mL 50-100 μm TODGA resins for isolation of W from Ti and Zr-Hf with high purity. The Ti was eluted with 3M HNO_3-0.01M HF; subsequently, the W was stripped with 3M HNO_3-5% H_2O_2; finally, the Zr-Hf were elueted with 3M HNO3-1M HF. The W fractions were further purified with secondary small TODGA columns packed with 0.3mL resins. The W fraction was dried to dryness and then ready for NTIMS (Negative Thermal Ionization Mass Spectrometry) measurements.

The W isotopes were measured with a TRITON Plus mass spectrometer using a two-line static data collection method (Touboul and Walker, 2012; Xu et al., 2019). The isobaric oxide corrections were made using in-run measured oxygen isotopic ratios (Archer et al., 2017; Xu et al., 2019).

Rock reference materials GSJ JB-3 and USGS BHVO-2 were dtemermined using the presented method and high-precsion W isotopic data were obtained.

References:
Touboul & Walker, 2012, IJMS, 309, 109–117;
Xu et al., 2019, Acta Petrologica Sinica, 35: 606-616;
Archer et al., 2017, IJMS., 414, 80–86.