Potassium isotopic systematics of oceanic basalts

BRENNA TULLER-ROSS[1], HEATHER LEE[1], HENG CHEN[1], BERNARD MARTY[2], KATHERINE A. KELLEY[3], KUN WANG (王昆)[1]

[1] Department of Earth and Planetary Sciences, Washington University in St. Louis, St. Louis, MO 63130, USA. (brenna@wustl.edu)

[2] CRPG-CNRS, Université de Lorraine, Vandoeuvre lès Nancy, France.

[3] Graduate School of Oceanography, University of Rhode Island, RI 02882, USA.

High-temperature isotopic fractionation during partial melting and other igneous differentiation processes has been observed in many non-traditional isotope systems [1]. The potassium (K) isotope system has not been extensively investigated historically due to a lack of high-precision analysis methods; however, thanks to the development of the Multiple Collector Inductively Coupled Plasma Mass Spectrometer (MC-ICP-MS), high-precision potassium isotope analysis methods have recently been established [2-5]. So far, a limited number of samples have been analyzed for their K isotopic compositions, and it is still unknown whether or not K isotopes fractionate during magmatic processes. Previously, Wang and Jacobsen [2,6] found no measureable isotopic differences among terrestrial igneous rocks and they defined a Bulk Silicate Earth (BSE) value of -0.479 ± 0.027 per mil for K isotopes based on measurements of 3 basalt samples from various tectonic settings.

In this study, we investigate their preliminary conclusions with a wider sample pool of geologically, geographically, and geochemically diverse basalt samples, comprised of 33 mid-ocean ridge basalts (MORB), 3 back-arc basin basalts (BABB), and 17 oceanic island basalts (OIB). Analysis of these 53 well-characterized basalt samples is performed using a Neptune Plus MC-ICP-MS [5]. We have thus far observed a limited variation of $^{41}K/^{39}K$ ratios across our spread of MORB samples and an average ratio that agrees well with the BSE value previously reported [2]. Overall results, including results for the OIB and BABB samples, are forthcoming pending final analysis and will be discussed at the conference.

[1] Teng, Watkins and Dauphas Eds. (2017) Non-Traditional Stable Isotopes. *Rev. Mineral. Geochem*. **82**. [2] Wang and Jacobsen (2016) *Geochim. Cosmochim. Acta* **178**, 223-232. [3] Li *et al*. (2016) *J. Anal. At. Spectrom.* **31**, 1023-1029. [4] Morgan *et al*. (2018) *J. Anal. At. Spectrom.* **33**, 175-186. [5] Chen *et al*. (2018) *Geostand. Geoanalytical Res*. in review. [6] Wang and Jacobsen (2016) *Nature* **538**, 487-490.