Potassium isotopic systematics of oceanic basalts

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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 measurable 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 $^{41}\text{K}/^{39}\text{K}$ 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.