Potassium isotopic composition of the Moon

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The depletion of moderately volatile elements (*e.g.*, Cl, K, Cu, Zn, Rb, and Cd) in the Moon compared to the Earth and CI chondrites has been recognized for decades. K/U ratio is widely used as the indicator of such volatile depletion. The Moon is ~6 times more depleted in K relative to the Earth and ~28 times relative to CI chondrites. The abundance and isotopic feature of moderately volatile elements in lunar samples thus provide important constraints on the mechanisms of the lunar formation and evolution events. Although K is one of the moderately volatile elements, it is significantly less volatile than Cl, Cu, Zn, Rb, and Cd. Potassium is less sensitive to magma ocean/local volcanic degassing and can be used as a tracer of the primary signature of planetary formation without subject to subsequent processes. Recently, Wang and Jacobsen reported a 0.4 per mil enrichment of heavier K isotopes in lunar samples relative to terrestrial samples [1] and attributed this enrichment as the natural consequence of a high-energy and high-angular-momentum Giant Impact [2]. However, there is still debate on such explanation [3], and the previous study only analyzed a limited set of lunar samples; thus it is necessary to conduct a more systematic investigation on the K isotope composition of the Moon.

In this study, we analyze 19 samples, including 15 Apollo lunar samples (Low/High-Ti basalts, anorthosites, norite, highland breccia, pyroclastic glasses) and 4 Antarctic lunar meteorites with geochemical and petrological diversities. NWA lunar meteorites have been excluded from our study because they have been demonstrated to be contaminated by terrestrial K during weathering. These 19 new samples in this study, plus the 7 previously measured Apollo lunar samples [1], will present the most comprehensive evaluation of K isotopic fractionation (if any) within the Moon and provide the best estimate of the bulk K isotopic composition of the Moon for inter-planetary comparison. The results and interpretations will be reported and discussed during the conference.

[1] Wang and Jacobsen (2016) *Nature* **538**, 487-490. [2] Lock et al. (2018) *J. Geophy. Res. Planets* **in press**. [3] Dauphas et al. (2018) *LPSC* abstr.#2481.