

Potassium Isotopic Fractionation during the Volatile Depletion In Early Solar System

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The Moon and other inner solar system bodies such as Mars, asteroid 4 Vesta, and Angrite Parent Body are depleted in volatile elements to different degrees when compared to the bulk solar system composition (see figure). The process(es) responsible for the volatile depletions, and their implications for planetary formation, are unclear. Last year, a newly developed isotope technique of potassium (a moderately volatile element) has been applied to lunar samples from Apollo 11, 12, 14 and 16 missions [1]. We discovered that the Moon is significantly enriched in heavy K isotopes relative to the Earth and some types of chondrites. These results support the Giant Impact Model for the Moon, e.g. [2]. This new study has demonstrated that K isotopes could be a useful tool to test different models of planetary formation. We are in the process of applying this new high-precision K isotope method to other volatile-depleted planetary bodies (such as Mars, Vesta, Angrite Parent Body). We will report the K isotope data of these samples and discuss what are the implications on the volatile depletion in the early history of the solar system.

[1] Wang and Jacobsen (2016) *Nature* **538**, 487-490.

[2] Lock *et al.* (2016) *Lunar Planet. Sci. Conf.* **47**, Abstract #2881.

