# K Isotope Variations in Chondrites As a Result of Incomplete Mixing of Presolar Isotopic Heterogeneity

YARAY KU*[1], STEIN B. JACOBSEN[1]

[1]Department od Earth and Planetary Sciences, Harvard University, Cambridge, MA02138, USA - yku@g.harvard.edu

The depletion of moderately volatile elements in many Solar System bodies is thought to result from nebular thermal processing. Chondrites, which have not been heated to the melting temperature, preserve, at least partially, the chemical and isotopic records from the protoplanetary disk. Among moderately volatile and relatively abundant elements, only potassium (K) has more than one stable isotope ($^{39}$K and $^{41}$K) that makes it a good candidate for studying history of volatile depletion in the early Solar System. Many previous studies have shown variations between different groups of meteorites [1-3] but no positive correlation was found between K depletion and K isotopic composition ($\delta^{41}$K).

We measured $\delta^{41}$K for samples with an uncertainty of 0.01 to 0.05‰ with our *Nu Sapphire* equipped with a collision cell. Relative to our lab standard, Merck *Suprapur* K, the *NIST 3141a* and seawater $\delta^{41}$K are +0.05‰ and +0.20‰, respectively. The average $\delta^{41}$K range from 0‰ to -0.21‰ for CO, CM, CI, and CV chondrites, ~ -0.29 for EH chondrites, and ~ -0.70‰ for ordinary chondrites. The average Mars and Vesta $\delta^{41}$K are -0.18‰ and +0.42‰. The $\delta^{41}$K for basaltic igneous terrestrial samples ranging from -0.3‰ to -0.55‰, lies between carbonaceous and ordinary chondrites despite the bulk Earth is depleted in K relative to CI chondrites. Apparently, the processes that depleted K and other moderately volatile elements in the Solar System did not fractionate K isotopes to a degree we can observe. An alternative explanation of the observed $\delta^{41}$K variations in meteorites is incomplete mixing of the heterogeneous distribution of $^{41}$K before the solar system formed.

Ref: [1] Zhao, C. et al. (2019) Meteoritics & Planetary Science. [2] Ku Y. et al. (2019). LPSC (abstract #1675). [3]Tian, Z. et al. (2019). GCA, 266, 611-632.