Chlorine and Zinc Isotope Composition of Lunar Materials: Insight into Volatile Element Isotope Fractionation on The Moon

A.M. GARGANO[1], Z.D. SHARP[1], & C.K. SHEARER[2]

[1]Department of Earth & Planetary Sciences, University of New Mexico, Albuquerque, 87131. agargano@unm.edu
[2]Institute for Meteoritics, University of New Meico, Albuquerque, 87131.

The Moon exhibits a uniquely large range of chlorine isotope compositions from ~0‰ to >35‰ thought to result from the degassing of light chlorine [1-3]. Zinc isotopes are expected to behave similiarly to Cl as these two elements have comparable volatility; however, notable samples such as "Rusty Rock" 66095 have the lightest Zn isotope measurements to date at -13.7‰ [4], and moderately high Cl isotope compositions at +15.6‰ [5]. We measured the chlorine isotope compositions of the Ferroan Anorthosites which show a positive δ^{37}Cl-[Cl ppm] trend and chlorine isotope compositions up to 30‰, in contrast to the negative δ^{66}Zn-[Zn ppm] trend and light to moderate Zn isotope compositions from -10 to +5‰ [6]. The light Zn data have been explained in terms of late deposition of light Zn on the surface of the Moon [4, 6]. The decoupling of these two volatile elements suggests that the heavy Cl is probably introduced as HCl derived from degassing of the underlying magma ocean and that extensive degassing of Cl occurred before Zn degassed.

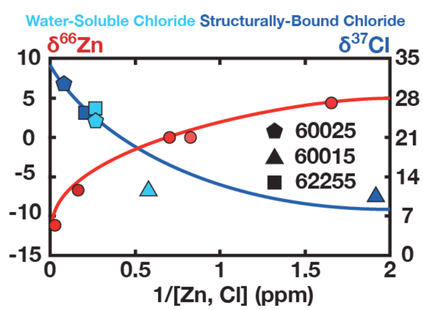

Figure 1: Inverse Zn and Cl concentrations relative to isotope values. Zn data are from [6].

[1] Sharp et al. (2010) *Science* **329**. [2] Barnes et al. (2016) *EPSL* **447**. [3] Boyce et al. (2015) *Sci. Adv*. [4] Day et al. (2017) *PNAS* **114.36**. [5] Shearer et al. (2014) *GCA* **139.** [6]. Kato et al. (2015) *Nature Communications* DOI: 10.1038/ncomms9617.