Cadmium isotope variations in bulk chondrites

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Chondrites exhibit nucleosynthetic isotope variations for several refractory elements (e.g. Ti, Mo, Zr [1-3]) at the bulk meteorite scale. On the other hand, for the moderately volatile elements, only Zn isotope variations have been recently reported [4]. From these observations, it follows that large-scale isotope heterogeneities at the onset of Solar System formation were generally restricted to the refractory elements. This study further investigates this trend by measuring the Cd isotope composition of bulk carbonaceous and enstatite chondrites, and acid leachates of Jbilet Winselwan (CM). Cadmium is a particularly ideal candidate for studying potential volatile element isotope variations because it has eight stable isotopes generated by different nucleosynthetic processes, and because it has an even lower 50% condensation temperature than Zn (726 K) with 652 K [5].

Samples are purified for Cd using a three-stage chromatographic separation procedure. Cadmium isotope measurements are performed with a Nu Plasma II MC-ICP-MS coupled to a DSN-100 introduction system. Two measurement cycles are used to measure all Cd isotopes plus ^{105}Pd, ^{115}In and ^{118}Sn, to monitor direct isobaric interferences. Using a 200 ppb Cd standard solution (Alfa Aesar), an average daily reproducibility (2SD, n = 29) of ± 15 ppm for ^{112}Cd/^{114}Cd and ± 95 ppm for ^{108}Cd/^{114}Cd was achieved.

Preliminary results of two CM (Jbilet Winselwan, Murchison), a CV (Allende) and an enstatite (Indarch) chondrite display small offsets in their Cd isotope compositions relative to the terrestrial Cd standard and terrestrial samples (lake sediments and the USGS Fe-Mn reference nodules Nod-A-1 and Nod-P-1). The small Cd isotope variations of these chondrites hint at the presence of small nucleosynthetic or potentially cosmogenic effects that influence the abundance of ^{113}Cd and ^{114}Cd. Bulk CR chondrites and leach fractions of Jbilet Winselwan will also be analysed to further constrain the origin of potential nucleosynthetic Cd isotope variations.

[1] Trinquier *et al*. (2009) *Science* **324**, 374-376. [2] Burkhardt *et al*. (2011) *EPSL* **312**, 390-400. [3] Akram *et al*. (2015) *GCA* **165**, 484-500. [4] Savage *et al*. (2014) *MAPS* **49**, A356. [5] Lodders (2003) *ApJ* **591**, 1220-1247.