Mass-dependent Pd isotope systematics of iron meteorites

M. EK[1]*, A. C. HUNT, M[1]. SCHÖNBÄCHLER[1]

[1]Department of Earth Sciences, ETH Zurich, Switzerland.
(*correspondence: mattias.ek@erdw.ethz.ch)

The mass-dependent isotope composition of siderophile elements in meteorites and terrestrial rocks can provide valuable information on processes that occur during planet formation in the early solar system. For example, terrestrial rocks display heavy Mo [1] and Pt [2] isotope compositions compared to chondrites. These are interpreted as the result of core formation, although Pt isotopes also provide evidence for a late addition of Pt to the mantle after core formation [2]. Large variations in the mass-dependent isotope compositions of Cu [3], Zn [4] and Ru [5] reported for different meteorites from the same iron meteorite group are attributed to fractional crystallisation of a solidifying metal core. Previous studies report Pd isotope data for ureilites, chondrites and terrestrial rocks [6]. Here we will present mass-dependent Pd isotope data for iron meteorites from the IAB, IIAB, IID, IVA and IVB groups to assess whether fractional crystallisation affects the Pd isotope composition.

A ^{104}Pd-^{108}Pd double spike procedure was developed for precise measurements of the mass-dependent Pd isotope composition by MC-ICP-MS. Modelling reveals that mass-independent Pd isotope variations, found in meteorites [7], can significantly affect the accuracy of the double spike procedure if not correctly accounted for. Replicate analyses of several individually processed aliquots of the IVA Gibeon yield a reproducibility of ± 0.025 ‰ (2 SD) for δ^{106}Pd/^{105}Pd.

Preliminary results identify small, but resolvable, isotopic variations between different samples. Our data show that most iron meteorites are enriched in the heavier Pd isotopes compared to chondrites and ureilites [6], which may reflect fractional crystallisation. Analysis of samples covering the entire range of the fractional crystallisation sequence recorded by the IIAB iron meteorite group is ongoing to test the validity of this hypothesis.

[1] Burkhardt *et al.* (2014) *EPSL* **391,** 201-211. [2] Creech *et al.* (2017) *GLP* **3**, 94-104. [3] Chen *et al.* (2016) *GCA* **182**, 145-154. [4] Bridgestock *et al.* (2014) *EPSL* **400**, 153-164. [5] Hopp *et al.* (2018) *GCA* **223**, 75-89. [6] Creech *et al.* (2017) *GCA* **216**, 28-41. [7] Ek *et al.* (2017) *JAAS* **32**, 647-656.