# Nucleosynthetic Mo isotope anomalies in iron meteorites – evidence for thermal processing

G.M. POOLE[1]* AND M. REHKÄMPER[1]

[1] ESE, Imperial College London, United Kingdom (*correspondence: g.poole11@imperial.ac.uk)

Over the last few years, nucleosynthetic isotope anomalies have been identified in bulk meteorites for a number of more refractory elements, including Ba, Cr, Ni, Ti and Zr. In contrast, other refractory elements have shown no such effects (e.g., Os, Hf). Recently, it has been proposed that thermal processing of material in the solar nebula is responsible for the normal and anomalous isotope compositions [e.g., 1, 2]. In particular, it has been argued that 'light' and 'heavy' r-process isotopes originate from distinct nucleosynthetic sources, which generate host phases that have different susceptibilities to thermal processing [3].

To inform the debate, we have investigated nucleosynthetic Mo isotope anomalies in an extensive range of iron meteorites to produce the largest dataset available to date, with a precision that is improved in comparison to previous studies [4, 5].

Systematic nucleosynthetic Mo isotope anomalies were observed in almost all iron meteorites. All magmatic irons were found to display deficits in s-process Mo isotopes, whereby the anomalies vary between groups. Only meteorites of the non-magmatic IAB/IIICD complex have terrestrial Mo isotopic composition. These results are in good agreement with the recent high-precision study of [5].

Comparison of our data with published results for other elements (e.g., Ru, Ba, Zr, Os, Hf, Ti) reveals that the Mo isotopic heterogeneity is in accord with the decoupling of 'light' and 'heavy' r-process nuclides. The improved precision of our data for irons furthermore allows, for the first time, the resolution of decoupled p- and r-process Mo isotope effects. Significantly, integration of the chondrite data of [5] with our results for irons suggests that both the magnitude of the Mo isotope anomaly and the extent of p-, r-process decoupling, are related to heliocentric distance. This new line of evidence provides additional support for models, which infer that thermal processing plays a key role in generating the nucleosynthetic isotope effects that are observed for 'lighter' refractory elements in meteorite parent bodies.

[1] Burkhardt et al. (2012) *EPSL* 357, 298-307. [2] Akram et al. (2015) *GCA* 165, 44-500. [3] Akram et al. (2013) *ApJ* 777, 169-180. [4] Dauphas et al. (2002) *ApJ* 565, 640-644. [5] Burkhardt et al. (2011) *EPSL* 312, 390-400.