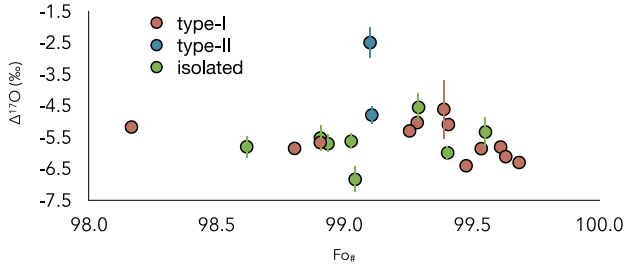
RELICTS OF THE PAST: REFRACTORY OLIVINE GRAINS IN UNEQUILIBRATED CHONDRITES

T. Gregory[1], T. Luu[1], S. Russell[2], and T. Elliott[1]. [1]Bristol Isotope Group, School of Earth Sciences, University of Bristol, Bristol, BS8 1RJ, UK, timothy.gregory@bristol.ac.uk, [2]Natural History Museum, Meteoritic and Cosmic Mineralogy, Cromwell Road, SW7 5BD, London, UK

Refractory forsterite (RF) grains are characterized by their high forsterite content ($Fo_{>\sim98}$) [1], enrichment in Al, Ca, and Ti, depletion in Ni and Mn [2], and enrichment in ^{16}O compared to "normal" olivine in the same meteorite [3]. They come in three varieties: (i) isolated grains within chondrite matrix [4], (ii) the cores of olivine phenocrysts in type-II chondrules [5], and (iii) phenocrysts in type-I chondrules [6]. Three models have been proposed for their formation: (i) direct condensation from the cooling solar nebula [1,7], (ii) formation in type-I chondrules followed by fragmentation and incorporation into matrix/chondrules, and (iii) fragmentation of the silicate portion of early differentiated planetesimals [8].

We have located twenty RFs across three different groups of unequilibrated chondrites (CV3, CO3.3, and L3.0), with the ultimate goal of examining their mass independent Mg isotopic compositions to put constraints on initial solar $\Delta^{26}Mg$. This is the focus of on-going work.

To date we have characterised the major (Fe, Mg, and Si) and trace (Al, Ca, Ti, Mn, and Ni) element compositions of the RF using EPMA, and determined their O-isotopic compositions using SIMS (CRPG, Nancy (France), as part of a Europlanet project). We find no clear relationship between the chemical composition (major and trace) and $\Delta^{17}O$ composition of RFs (see figure). In $\Delta^{17}O$, isolated RFs range from -4.5 to -6.8‰, type-I RFs range from -4.6 to -6.4‰, and type-II RFs range from -2.5 to 4.8‰. These data suggest multiple reservoirs with varying $\Delta^{17}O$ in which these RFs formed, in agreement with previous work [e.g. 8].



References: [1] Reid A. M. et al. 1970. *GCA* 34: 1253-1255; [2] Pack A. et al. 2004. *GCA* 68: 1135-1157; [3] Weinbruch S. et al. 1993. *GCA* 57: 2649-2661; [4] Steele I. A. 1989. *GCA* 53: 2069-2079; [5] Jones R. H. 1990. *GCA* 54: 1785-1802; [6] Jones R. H. and Scott E. R. D. 1989. *19th LPSC*: 523-536. [7] Olsen E. and Grossman L. 1978. *EPSL* 42:111-127; [8] Libourel G. and Chaussidon M. 2011. *EPSL* 301: 9-12.