Stable isotope signatures of ureilites on a mineral scale

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Mass-dependent isotope fractionation, resulting from slight differences in the efficiency with which the isotopes of an element participate in planetesimal processes, can be used to understand the early Solar System history. Ureilites are particularly interesting for the study of planetary differentiation, as they are thought to be mantle restites and constitute chemical fingerprints of the early stages of planetary evolution. At the same time they show features of incomplete equilibration of the primitive assemblages.

Stable isotope signatures of Fe are sensitive to redox conditions [1], and as such are potent tracers of redox variations during early planetary differentiation and core formation. In this presentation I will discuss high-precision stable isotope ratios of multiple transitional metals measured in separate reservoirs and silicate minerals of ureilite meteorites. Preliminary results indicate that ureilite GRO 95575 has lighter Fe isotopic signatures than previously reported for whole rock ureilites by Barrat *et al.* ($\delta^{56/54}$Fe range from 0.01 to 0.11 ‰ was reported in [2]). Magnetic fractions of the ureilites were found to have lighter $\delta^{56/54}$Fe than their non-magnetic counterparts. This hints towards a contribution of sulfides into the Fe isotopic composition of the refractory ureilite fraction. Copper has light $\delta^{65/63}$Cu isotopic signatures in whole rock ureilites, more similar to those of ordinary chondrites than terrestial or CI values. In the magnetic fractions of ureilites, Cu is also isotopically lighter than in their silicate counterparts. Combination of results from isotopic analysis of elements such as the mineral-forming Fe, chalcophile Cu, or the volatile trace element Zn in minerals separates and *in situ* determination of elemental proxies using LA-ICP-MS can further constrain equilibration temperatures and potentially differentiate between the evaporation loss models at the parent planetesimal.

[1] Sossi *et al.* (2012) *Contrib Mineral Petrol* **164**, 5, 757-772. [2] Barrat *et al.* (2015) *EPSL*, **419**, 93-100.