The carbonaceous and non-carbonaceous meteorite dichotomy: Implications for the Mo-Ru cosmic correlation

E.A. WORSHAM, C. BURKHARDT, M. FISCHER-GÖDDE, T.S. KRUIJER, T. KLEINE[1]

[1]Institut für Planetologie, University of Münster, 48149 Münster, Germany (worsham@uni-muenster.de)

Nucleosynthetic isotopic anomalies in bulk meteorites reflect the heterogeneous distribution of isotopically diverse presolar materials in the early solar nebula, making them powerful tracers of planetary genetics. Molybdenum and Ru isotope anomalies are attributable to variable deficits in an *s*-process component compared to the Earth's mantle, and are correlated with one another, suggesting they are hosted in the same or similar presolar carriers [e.g., 1-3]. However, recent work has identified a dichotomy of Mo isotopic compositions between "carbonaceous" (CC) and "non-carbonaceous" (NC) meteorites [4]. By studying the extent to which this Mo-Ru correlation holds for CC meteorites, it may be possible to elucidate the natures of the presolar carriers of nucleosynthetic anomalies and contrain the processes leading to the dichotomy between CC and NC meteorites. To address these issues we obtained new Ru and Mo isotopic data for 'rare' iron meteorite groups, several of which may belong to the CC meteorites.

The Mo isotopic compositions indicate that, in addition to the IVB, IID, and IIIF irons [4], the IIC and IIF irons also belong to the CC suite. The ^{92}Mo and ^{100}Ru compositions of most iron meteorites define a roughly linear relationship, in agreement with [1-3]. However, most CC irons plot slightly off the trend defined by the NC meteorites, consistent with the addition of *r*-process enriched material to the CC suite. Moreover, the CC meteorites collectively exhibit variable Mo isotopic compositions, but more restricted ^{100}Ru compositions. This suggests that the Mo-Ru correlation is not reflected in the CC suite, implying that the presolar carriers of *s*-process Mo and Ru may have been decoupled in the precursor materials of these meteorites. This decoupling may have occurred through some thermal or chemical process which only affected the carbonaceous suite. Collectively, the combined Mo and Ru isotopic data not only reveal a distinct genetic heritage of CC and NC meteorites, but they also demonstrate that processes affecting presolar components were fundamentally different in both reservoirs.

[1] Dauphas N. et al. (2004) *EPSL 226*, 465-475. [2] Burkhardt et al. (2011) *EPSL 312*, 390-400. [3] Fischer-Gödde M. et al. (2015) *GCA 168*, 151-171. [4] Budde G. et al. (2016) *EPSL 454*, 293-303.