Fe-Silicide-bearing meteorites: Analogues for the early building blocks of terrestrial planets?

HILARY DOWNES[12], NACHIKETA RAI[12], CAROLINE SMITH[2], AIDAN ROSS[12] AND JASON HERRIN[3]

[1]Centre for Planetary Sciences, UCL-Birkbeck, London, UK
[2]Natural History Museum, London, UK
[3]Nanyang Technological University, Singapore

In heterogeneous accretion models for Earth and other terrestrial planets, the early accreting phases are considered to have been strongly reduced [1]. Ureilites are ultramafic achondrites composed largely of olivine and pyroxenes that are thought to be derived as residues of partial melting within the mantle of a carbon-rich parental planetesimal to ureilites [2]. Despite having undergone high temperature processes and relatively high degrees of partial melting (20–30%), ureilites retain not only a significant amount of iron metal and relatively high abundances of siderophile elements but also contain phases such as iron silicides [3-5]. The presence of FeSi phases and other Fe-X phases (X = S, P, C) in ureilites indicates very low redox conditions. These conditions must have occurred at low pressures, since the ureilite parent asteroid is estimated to have been only ~100 km in radius. Such small bodies at different stages of metal-silicate segregation may have contributed to the accreting terrestrial planets. Here we explore, using experimental partitioning data, isotopic and elemental composition, whether small planetesimals akin to the ureilite parent asteroid could have been the feeding bodies for the accreting Earth during its early reduced phase.

[1] Wade, J., Wood, B.J., 2005. *Earth Planet. Sci. Lett.* **236**, 78–95. [2] Mittlefehldt D. W., McCoy T. J., Goodrich C. A. and Kracher A. (1998) In Planetary Materials (ed. J. J. Papike). *Mineralogical Society of America. Rev. Mineral.* **36**. p. 195. [3] Herrin J. S., Mittlefehldt D. W. and Jones J. H. (2008). *Meteorit. Planet. Sci.* **43**(Suppl.), #5327 (abstr.) [4] Smith C. L., Ross A. J. and Downes H. (2010). *Meteorit. Planet. Sci.* **45**(Supp.), #5221 (abstr.) [5] Ross A. J., Downes H., Smith C. L. and Jones A. P. (2009) *Meteorit. Planet. Sci.* **44**, #5269 (abstr.)