

Experimental determination of W isotope fractionation between liquid metal and liquid silicate

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Mass-dependent stable isotope fractionation provides a tool to decipher the conditions, processes, and mechanisms acting during differentiation (core formation) and igneous activity on planetary bodies (e.g., [1] [2]). This furthers our understanding of the present-day chemical and isotopic compositions of terrestrial and extraterrestrial materials. However, detailed knowledge of isotopic fractionation factors during these processes is inevitable. It has been shown and parameterized experimentally that, e.g., Mo and Si stable isotopes are fractionated during metal-silicate differentiation [3] [4], whereas, e.g., Fe is not [5]. The extent to which stable W isotopes fractionate during metal-silicate segregation has not been constrained experimentally yet.

To resolve potential equilibrium fractionation of W isotopes during core formation, metal-silicate equilibration experiments are conducted in a centrifuging furnace ($T_{\max} \sim 1700^\circ\text{C}$) to efficiently separate the metallic from the silicate liquid. Contamination from metal in the silicate has to be minimized to not disturb any fractionation effects. Elemental Sn is used in synthetic metal-oxide mixtures to lower the melting point of the metal. This helps to achieve efficient metal-silicate separation at relatively low temperatures where the isotope fractionation is larger. The experiments will be performed over a range of temperatures to calibrate the temperature dependence of possible stable isotope fractionations. High-precision isotope analyses of the run products, both separated metal and silicate, are performed using our newly developed ^{180}W - ^{183}W double spike, permitting precise measurements of the anticipated small isotope fractionations. The results and implications derived from experimental runs will be presented and discussed at the meeting.

[1] Moynier *et al.* (2011) *Science* **331**, 1417-1420. [2] Wang *et al.* (2012) *GCA* **89**, 31-45. [3] Hin *et al.* (2013) *EPSL* **379**, 38-48. [4] Hin *et al.* (2014) *EPSL* **387**, 55-66. [5] Hin *et al.* (2012) *GCA* **93**, 164-181.