

Experimental determination of stable Pd, Ru and S isotope fractionation between liquid metal and liquid silicate

TOBIAS GRÜTZNER¹, STEPHAN KLEMME¹ AND ARNO ROHRBACH¹

¹Westfälische Wilhelms-Universität Münster, Institut für Mineralogie, Corrensstr. 24, 48149 Münster, Germany

The abundances of highly siderophile elements (HSE, e.g. Ru, Pd) and siderophile volatile elements (SVE, e.g. S, Te) in Earth's mantle are usually explained by late accretion of broadly chondritic material. Yet, the behavior of some elements leaves questions open about the late veneer and Earth's core formation.

For example, due to the less siderophile behavior of Pd at high temperatures, a late veneer is not required to explain the Pd concentration in Earth's mantle in contrast to other HSE [1-3]. S isotopes from MORB show an excess of light S isotopes in the Earth's mantle relative to chondrites, which might be balanced by light S-isotopes core. This implies that accretion of the volatile element S would have occurred rather during core formation than during the late veneer [4]. However, Earth's mantle rocks show the same S/Te as carbonaceous chondrites, but S and Te have very different metal-silicate partition coefficients [4,5]. A simple possibility is, therefore, that S and Pd isotopes reflect both processes: core formation and late accretion [6]. Any highly siderophile element remaining in the mantle after core formation should show strong mass-dependent isotope fractionation and consequently, a different isotopic signature compared to chondrites. In case these elements are largely derived from the late veneer, they should show no isotope fractionation due to core formation.

To test these assumptions, we performed metal-silicate partitioning experiments in a 1 atm centrifuge at 2000 r/min and in a piston cylinder press (1 GPa) at temperatures between 1200 °C and 1450 °C. With these experiments we can determine the partitioning of the elements Pd, S (and Ru), as well as potential stable isotopes at different temperatures and pressures. We will present first results and implications of our centrifuge and piston cylinder runs.

[1] Righter et al. (2008) *Nature Geosci.* **1**, 321-323. [2] Mann et al. (2012) *GCA* **84**, 593-613. [3] Brenan & McDonough (2009) *Nature Geosci.* **2**, 798-801. [4] Wang & Becker (2013) *Nature* **499**, 328-331. [5] Rose-Weston et al. (2009) *GCA* **73**, 4598-4615. [6] Labidi et al. (2013) *Nature* **501**, 208-211.