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Metal-silicate partitioning of the HSEs in S-bearing systems - Implications for Earth's core formation

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Based on metal-silicate partitioning experiments in S-free systems, the highly siderophile elements (HSEs) were effectively removed from the mantle and became strongly fractionated during core formation. However, sulfur is likely one of the light elements in the core, and was added late during Earth's accretion. Hence, the metal separating to the core became more S-rich, which could have a strong effect on the behaviour of the HSEs. Therefore, we have studied the partitioning of Pt, Pd, Ru and Ir between a molten peridotite and a S-bearing Fe-HSE alloy or sulfide (5-35 wt.% S) in a multianvil apparatus at 11 GPa and 2200 °C. Results show that the HSEs become less siderophile with increasing S-content to varying degrees: While the least siderophile HSEs show only a small effect, the more siderophile HSEs are strongly influenced. As a result, K_D 's of Pt, Pd, Ru and Ir converge towards high S concentrations. These results imply that during late stages of accretion the HSEs can be extracted to the core by a S-rich melt with only small inter-element fractionation.

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Cite abstract as:

Laurenz, V., Rubie, D. C., Frost, D. J. (2013) Metal-silicate partitioning of the HSEs in S-bearing systems - Implications for Earth's core formation. Paneth Kolloquium, Nördlingen (Germany), abstract URL: <http://www.paneth.eu/PanethKolloquium/2013/0076.pdf> (abstract #0076).