

High pressure solid-metal/liquid-metal partitioning of Os, Re and Pt in the Fe-S system

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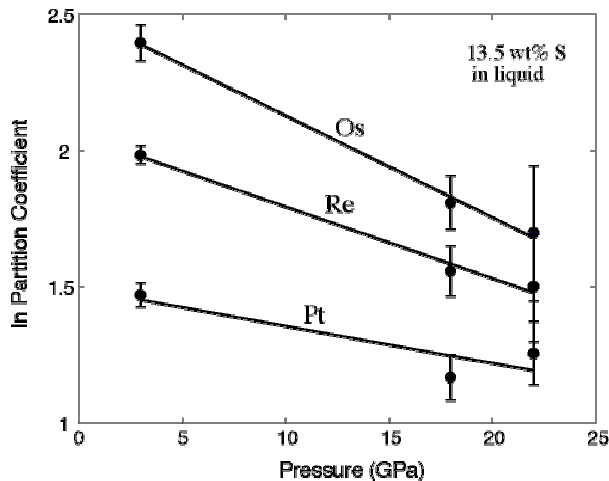
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Coupled enrichments of $^{186}\text{Os}/^{188}\text{Os}$ and $^{187}\text{Os}/^{188}\text{Os}$ in mantle-derived materials have been suggested to reflect material contributions from the outer core [e.g. 1]. This idea requires significant fractionation of Pt, Re and Os during crystallization of the inner core; and because the inner core is small, differences in solid/liquid metal partition coefficients among these elements must be large.

We performed multi-anvil experiments to determine solid/liquid partition coefficients in the Fe-S system over a large pressure range, from 3 to 22 GPa. The compatibility of Pt, Re and Os in the solid metal increases exponentially as the sulfur content in the liquid increases, consistent with results at atmospheric pressure [2]. At constant liquid composition the partition coefficients for all three elements decrease significantly with increasing pressure (see Figure). The relative values and pressure dependences of the partition coefficients are consistent with elastic strain considerations. At the maximum light element concentration in the outer core (~10 wt%) and pressures beyond ~10 GPa, Os, Re and Pt are insufficiently compatible in solid iron to be fractionated significantly by inner core crystallization.



References

- [1] Brandon A.D., Norman M.D., Walker R.J., Morgan J.W. (1999) *EPSL* **174**, 25-42.
- [2] Chabot N.L. and Jones J.H. (2003) *MAPS* **38**, 1425-1436.