Element partitioning during core formation

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High-pressure metal-silicate partitioning experiments demonstrate that the mantle contents of some moderately siderophile elements (Ni, Co, P, W, Mo, V) are consistent with core-mantle equilibration at high pressures and high temperatures (e.g. [1-7]). This conclusion is one of the bases for the magma ocean model, in which molten core materials segregate through a largely molten silicate mantle. To constrain further such a model, one should ask whether these conditions of core formation are consistent with the mantle contents of other elements. In addition to pressure and temperature, composition is a key factor that can affect element distribution during core formation. In particular, the degree of oxidation of the planetary building materials, which depends on composition, has been shown to be a critical parameter.

Here, we review the experimentally determined partitioning behaviour between Fe-rich molten metal and silicate melts of siderophile elements and other elements normally regarded as moderately volatile and refractory lithophile. We will show how these data help us constrain the composition of the core and bulk silicate Earth. Uncertainties on current core formation and composition models and future directions for work will also be presented.

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