Pt-Re-Os partitioning between solid and liquid metal in the Fe-Ni-S system

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The Os isotopic signature observed in some plume materials has been suggested to reflect contributions of materials from the outer core (e.g. Brandon and Walker, 2005). ^{187}Re decays to ^{187}Os with a half-life of ˜42 Ga and ^{190}Pt decays ^{186}Os with a half-life of 489 Ga. These elements (Os, Re and Pt) are highly siderophle elements and are believed to concentrate in the metallic core.Pt/Os and Re/Os ratios of the liquid outer core may have been elevated by crystallization of the solid inner core over the Earth's history, resulting from differences in partition coefficients (solid metal/liquid metal) as seen in magmatic iron meteorites.

Partitioning experiments of Pt, Re and Os in the Fe-Ni-S system at high pressure were performed using multi-anvil apparatus and diamond anvil cell (DAC) up to 20GPa. Chemical analyses of all elements were determined using JXA-8800M electron probe microanalyzer with wave-dispersive spectrometry.

Measured partition coefficients of Pt, Re and Os are significantly sensitive to sulfur content of the liquid metal and are insensitive to pressure. On the basis of the present experimental results, it is unlikely to generate significant Pt-Re-Os fractionation.

On the other hand, it is assumed h.c.p.-Fe phase as the most likely candidate for the solid inner core, the solid metal is f.c.c.-Fe phase under conditions in this study. Since partition coefficients by diamond anvil cell are consistent with those by multi-anvil apparatus at the same condition (20 GPa), we can establish credibility of partitioning results obtained from diamond anvil cell. Then, more experimental data performed using DAC at stability field of h.c.p.-Fe is required.