Fe-Mg partitioning between (Mg,Fe)SiO3-perovskite and magnesiowustite under lower mantle condition

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The Earth’s lower mantle is considered to be composed mainly of (Mg,Fe)SiO3-perovskite and magnesiowustite, and the iron contents influence their densities and phase relations. Therefore,it is very important to determine the iron contents of these phases in understanding structure and dynamics in the lower mantle. In this study,we have experimentally determined the partitioning of iron between these two phases and its temperature dependence.

Several workers have studied Fe-Mg partitioning between (Mg,Fe)SiO3-perovskite and magnesiowustite,but temperature dependence on the partitioning has not been well understood.

We conducted high-pressure experiments using a Kawai type high-pressure apparatus at 24 GPa,and at 1400-2000C. We used San Carlos olivine with a composition of (Mg0.91Fe0.09)2SiO4 as starting material.

After the high presser and temperature runs, the products were examined using SEM, EDS, X-ray and FE-SEM diffraction techniques to observe the microstructures, to measure the chemical composition and to identify the phase present.

The partition coefficient defined as K=(Fe/Mg)Pv/ (Fe/Mg)Mw increased from 0.19 to 0.34, with increasing temperature from 1400C to 2000C.