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Fe-Mg partitioning between perovskite and ferropericlase in the lower mantle

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Abstract

Fe-Mg partitioning between perovskite and ferropericlase in the $MgO-FeO-SiO_2$ system has been studied up to about 100 GPa at around 2000 K using a laser-heated diamond anvil cell (LHDAC). The compositions of both phases were determined by using analytical transmission electron microscopy (ATEM) on the recovered samples. Present results reveal that the Fe-Mg apparent partition coefficient between perovskite and ferropericlase [$K_D^{Pv/Fp} = (X_{Fe}^{Pv} X_{Mg}^{Fp})/(X_{Mg}^{Pv} X_{Fe}^{Fp})$] decreases with increasing pressure for a constant FeO of the system, and it decreases with increasing FeO content of ferropericlase. The gradual decrease of $K_D^{Pv/Fp}$ with increasing pressure is consistent with the spin transition in ferropericlase occurring in the broad pressure range from 50 to 100 GPa at around 2000 K.

Keywords: Perovskite, ferropericlase, Fe-Mg partitioning, LHDAC, FIB