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Phase relations in (Mg<sub>0.93</sub>,Fe<sub>0.07</sub>)SiO<sub>3</sub> to 24 GPa: implications for seismic velocities of subducted harzburgite

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Phase relations in (Mg<sub>0.93</sub>Fe<sub>0.07</sub>)SiO<sub>3</sub> was studied at pressures between 18 and 24 GPa and at a temperature of 1773 K. Experiments were carried out using a Kawai-type apparatus and tungsten carbide anvils with truncated edge length of 2.5 mm. The starting material was a synthetic pyroxene with (Mg<sub>0.93</sub>,Fe<sub>0.07</sub>)SiO<sub>3</sub> composition prepared using a room-pressure furnace. Samples with compositions of MgSiO<sub>3</sub> and Mg<sub>2</sub>SiO<sub>4</sub> were also put into the cell assembly for comparison to observe effect of iron and for an internal pressure standard. According to the experimental results in (Mg<sub>0.93</sub>,Fe<sub>0.07</sub>)SiO<sub>3</sub>, akimotoite is stable in a very narrow pressure range less than 0.5 GPa at pressure of about 22 GPa, whereas ringwoodite+stishovite is stable in wide pressure range from 19 to 22 GPa. In contrast, akimotoite is stable over a wide pressure range of about 3GPa in MgSiO<sub>3</sub>. However, iron does not affect the phase transition pressure from akimotoite to perovskite and that from pyroxene to wadsleyite+stishovite. The akimotoite-perovskite transition pressure is lower than that of post-ringwoodite transition in Mg<sub>2</sub>SiO<sub>4</sub>, which is consistent with a result by thermodynamic calculation based on newly obtained heat capacity measurements. Phase relations in (Mg<sub>0.93</sub>,Fe<sub>0.07</sub>)SiO<sub>3</sub>, a representative composition of pyroxene in harzburgite of oceanic lithosphere, has important implications for phase relations in harzburgite and the dynamic behavior of subducted stagnant slabs in the mantle transition zone.

キーワード: phase relations, effect of iron, harzburgite, mantle transition zone

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