

Generation of metastable cubic-perovskite in high-pressure phase transformation in Ca(Mg,Fe,Al)Si₂O₆

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We conducted in situ X-ray diffraction measurements using sintered diamond multianvil apparatus MAX-III installed at KEK-PF, Japan. Edge length of sintered diamond anvil is 10 mm. Synthetic glass and a synthetic clinopyroxene were used as the starting material. They have same composition, Ca_{0.9}Mg_{0.5}Fe_{0.2}Al_{0.1}Si_{2.1}O₆. Experiments were performed at about 30 GPa, up to 1900 K. We observed cubic-perovskite (CM-perovskite) generated from starting glass at about 1300 K and it decomposed into cubic and orthorhombic perovskites and stishovite at 1800 K. In another experiment using crystal pyroxene as starting material, 2 cubic perovskites and orthorhombic perovskite generated from starting pyroxene and one of the cubic phases, CM-perovskite, decomposed at 1200 K. These results indicate that the assembly, cubic and orthorhombic perovskites and stishovite, is more stable and CM-perovskite is a metastable phase at 30 GPa over 1200 K.