Formation of metastable assemblages and the grain-size reduction in the postspinel transformation

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In order to clarify mechanisms and kinetics of the postspinel transformation in Mg2SiO4, in situ X-ray diffraction experiments under high pressure and temperature were carried out using "SPEED-1500" and "MAX90" multi-anvil high pressure apparatus installed at SPring8 and KEK, respectively. Transformation experiments were conducted at 22.7-28.2 GPa and 1133-1473K. We confirmed that Mg2SiO4 spinel metastably dissociated into MgSiO3 ilmenite and periclase, stishovite and periclase, which are considered to be the intermediate step in the transformation from spinel into MgSiO3 perovskite and periclase. The postspinel assemblages grow into spinel with lamellar textures. The lamellar spacing becomes less than 0.5 micron with the overpressure of more than 0.5 GPa.