The lattice preferred orientation of Akimotoite MgSiO3

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Some seismological studies suggested existence of an anisotropy in the mantle transition zone. Various interpretations of anisotropy have been shown. Plausible mechanisms for the anisotropy are the lattice preferred orientation, shape preferred orientation, and layer structures in mesoscopic or macroscopic scales. Therefore, it is important to investigate the deformation-induced lattice preferred orientation of crystals for discussing the relation between seismic anisotropy and the lattice preferred orientation.

High pressure deformation experiments were performed using a Kawai-type multi-anvil apparatus installed at Tohoku University. First we synthesized polycrystalline MgSiO3 ilmenite from MgSiO3 glass by heating at 21GPa and 1573K for 1 hour. The synthesized MgSiO3 ilmenite was used as a starting material for the high pressure deformation experiments. The sample assembly was composed of sintered ZrO2 pressure medium and LaCrO3 heater. The sample was sandwiched between alumina pistons inserted in the furnace assembly. This assembly induced high differential stresses during compression. After deformation experiments, the lattice preferred orientation was determined by the EBSD (electron backscatter diffraction) technique installed at Chiba University. The deformation microstructure was observed by TEM (transmission electron microscopy) installed at Tohoku University. The present result provides important implications for understanding of the structure and dynamics of the subducted slabs.