The lattice preferred orientation of akimotoite MgSiO3

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Akimotoite, the ilmenite structured MgSiO3, which is the major constituent of the harzburgite layer of subducting slabs, is likely to be the most anisotropic mineral in the mantle transition zone. Therefore, the deformation-induced crystallographic preferred orientation of akimotoite provides important information on seismic anisotropy in the mantle transition zone. Plastic deformation experiments of MgSiO3 polycrystalline ilmenite (akimotoite) at high pressures and temperatures were carried out at confining pressure of 20GPa to 22GPa, temperature of 1273-1573K using a Kawai-type multi-anvil apparatus installed at Tohoku University. The sample was sandwiched between alumina pistons, which induced high differential stresses inserted in the furnace assembly. Two type-modified assemblies, uni-axial compression geometry and simple shear geometry were used for deformation experiment. Crystallographic orientations of deformed ilmenite grains were measured by the electron backscatter diffraction (EBSD) technique at Chiba University. A c-axis maximum parallel to the compression direction develops at higher temperatures (T=1473-1573K), while c-axes are oriented parallel to the shear direction at the lowest temperature (T=1273K). This change in crystallographic preferred orientation of akimotoite may be due to a change in dominant slip system with temperature. In order to confirm this, TEM observations are now in progress. Seismic anisotropy of deformed MgSiO3 polycrystalline ilmenite calculated from the crystallographic orientation data is strong; azimuthal anisotropy is 4.7% for P wave and 3% for S wave, and S wave polarization anisotropy is up to 4.2%