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# The compression experiments on forsterite-melt system

SUEYOSHI, Kenta[1*], HIRAGA, Takehiko[1], MIYAZAKI, Tomonori[1]

[1]Earthquake Research Institute,The University of Tokyo

It is known that the earth mantle has anisotropy in seismic wave velocity (Tanimoto and Anderson, 1984). Fast direction of the wave propagation corresponds approximately to the direction of the plate motion, indicating that the mantle anisotropy is originated from the mantle flow. As the mantle flow, olivine crystallographic axes might align to the specific direction resulting in the formation of anisotropy in the wave velocity. Partial melt can be present where the olivine deforms significantly in the mantle so that it is required to know how olivine grains acquire lattice preferred orientation (LPO) under the presence of melt experimentally.

We conducted compression creep experiments on forsterite + anorthitic melt samples with a dimension of ph10∗10mm. We used an Instron type deformation testing machine equipped with a vertical furnace. Temperature condition of 1270 degrees(Celsius) and strain rate of 10ˆ(-6˜-8)/s were used. During the experiment, most of the samples exhibited the strain hardening. Microstructure observations after the tests revealed the occurrence of the significant grain growth during the tests. We attribute the hardening to the increase of the grain size. The samples demonstrated strain weakening after the hardening stage. Such weakening is possibly due to the crack formation in samples. After the deformation, well polished sample sections were prepared for SEM/EBSD analysis. We found b-axis alignment of forsterite parallel to the compression direction. Since creep strength of the sample is grain size sensitive, the samples are estimated to have deformed via diffusion creep mechanism. LPO development under the deformation mechanism should be explored.

Keywords: forsterite-melt system, EBSD, creep, LPO