Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SIT037-09 Room: Exibition hall 7 subroom 2 Time: May 27 14:15-14:30

Creep property of forsterite-enstatite system

Miki Tasaka[1*], Takehiko Hiraga[1], Katsuyoshi Michibayashi[2]

[1]ERI, the Univ. of Tokyo, [2]Institute of Geosciences Shizuoka Univ.

Hiraga et al. (2010) suggests that the grain growth of two phase system of forsterite (first phase: Fo) and enstatite (second phase: En) can be explained by Zenner pinning. Zener pinning is the effect that one phase blocks grain boundary movement of another phase. And it is known that if Zener pinning is effective, grain size in two phase system is a function of grain size of first phase, grain size of second phase and volume fraction of second (Smith, 1948). Using Zennr Pinning effect, Hiraga et al. (2010) suggests the viscosity changes of En volume fraction. In this presentation, in order to check this idea, uniaxial compression experiments were conducted under atmospheric pressure.

We could successfully obtain fine-grained and high density polycrystalline aggregates of the composition from Fo 100 to Fo58.5En41.5 by simply changing mixing ratio of starting materials of Mg(OH)2 and SiO2.

This deformation experiments were conducted using INSTRON5567 under the temperature of 1350 degrees C with constant rate of compression (0.02mm/min) and final strain of 25% in Earthquake Research Institute, the University of Tokyo.

We succeeded in homogeneous deformation of samples and obtained high accuracy stress-strain curve in the experiments. According to the FE-SEM analysis of microstructure, we found that Zener pinning effects can explain grain growth during deformation. In addition, we found (1) Decrease of viscosity corresponding to volume fraction of En, which could be due to the grain growth following Zener pinning. (2) Increase of viscosity corresponding to strain, which could be due to the change of deformation mechanism from boundary diffusion creep to body diffusion creep.

Keywords: grain growth, Zener pinning, secondary phase, viscosity, mantle