Crystallographic preferred orientation and rheological property of the dense hydrous magnesium silicate phase A

*白石 令[1]、佐脇 泰典[1]、澤 燦道[1]、武藤 潤[1]、鈴木 昭夫[1]
*Rei Shiraishi[1], Yasunori Sawaki[1], Sando Sawa[1], Jun Muto[1], Akio Suzuki[1]

1. 東北大学理学研究科地学専攻
1. Department of Earth Science, Graduate School of Science, Tohoku University

The dense hydrous magnesium silicate phase A is formed by the decomposition of antigorite in the cold subducting slabs around 200 km depth. It is suggested that cold slab contains up to about 40 % phase A (Hacker et al., 2003). The hydrous minerals are important in terms of the water carrier and the generation of the intermediate earthquakes.

In order to clarify the deformation property of subducting slab, it is important to investigate the crystallographic preferred orientation (CPO) and rheology of phase A. Although two deformation experiments were reported so far, the recovered sample was not analyzed (Mussi et al., 2012; Gouriet et al., 2015). The CPO and rheology of phase A have not been sufficiently investigated yet.

Therefore, in this study, we conducted high pressure deformation experiments with the deformation-cubic anvil press (D-CAP). Firstly, the polycrystalline phase A samples were synthesized in the multianvil apparatus and cut into disks with a thickness of ˜ 500 μm for a simple shear deformation cell assembly. The sample deformed at a pressure of 6 GPa and a temperature of 873 K with the constant displacement rate. We analyzed the CPO of the recovered sample using the Electron Back-Scatted Diffraction (EBSD).

Deformed phase A has a CPO characterized by a strong c-axis maximum normal to the shear plane, and <112(-)0> and <101(-)0> axis girdles parallel to the shear plane. This CPO is expected a dominant slip system with glide on (0001), which is in good agreement with the previous study (Gouriet et al., 2015). The deformed sample exhibits network fractures and many grain-scale microcracks. There is no apparent offset along both of fractures and microcracks. Therefore, it is expected from these microstructures that dominant deformation mechanism was cataclastic flow.

It is still early to conclude with only this data, so we will conduct more experiments to measure stress and strain rate and discuss seismic anisotropy of the deformed phase A.

キーワード：地震波異方性、結晶選択配向、phase A
Keywords: seismic anisotropy, crystallographic preferred orientation, phase A