



Water-induced fabrics of olivine in peridotites from the Lindas Nappe, Bergen arc, western Norway

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The Bergen Arc, western Norway is composed of several units distributed in an arc shape. Lindas Nappe is one of these units. Two peridotite outcrops in Lindas Nappe anorthositic complex were studied to understand deformation conditions of olivine. A mylonite zone was found in the peridotites and deformation fabrics of small olivine in the area were also studied. Lattice preferred orientation (LPO) of olivine was determined using the electron backscattered diffraction (EBSD) in SEM. Water content of olivine in the samples was measured using the Fourier transformation infrared (FTIR) spectroscopy.

We observed three different types of LPOs (E-, B-, and A-type) of olivine in a large grain area. Sample (372) showed that [100] axes of olivine are aligned subparallel to the lineation and [001] axes aligned normal to the foliation, which is known as E-type LPO of olivine (Jung et al., 2006). Three samples (375, 380, and 381) showed that [001] axes of olivine are aligned subparallel to the lineation and [010] axes aligned normal to the foliation, which is known as B-type LPO of olivine. Another sample (379) in the large grain area showed that [100] axes of olivine are aligned subparallel to the lineation and [010] axes aligned normal to the foliation, which is known as A-type LPO of olivine. On the other hand, we observed two types of LPOs of olivine in a mylonite zone with a small grain-size: B- and C-type. C-type LPO is characterized as [001] axes of olivine aligned subparallel to the lineation and [100] axes of olivine aligned nearly normal to the foliation. Previous experimental study showed that B-, C-, and E-type LPO patterns were observed in a wet condition and A-type LPO was observed in a dry condition (Jung et al., 2006).

FTIR analysis of olivine revealed that a sample showing the A-type LPO showed only small IR absorption peaks in the range of wave numbers 3000 - 3750 cm⁻¹. In contrast, samples showing B-, C-, and E-type LPO showed large IR absorption peaks in the range of wave numbers 3000 - 3750 cm⁻¹ which is related to stretching vibrations due to O-H bonds. Small olivine grains in a mylonite zone where both B- and C-type LPOs were observed also showed large IR absorption peaks. These observations indicate that the peridotite samples from Lindas Nappe, Bergen Arc, western Norway were deformed under a wet condition during late stage deformation.

Reference

Jung, H., Katayama, I., Jiang, Z., Hiraga, T., Karato, S., 2006. Effect of water and stress on the lattice-preferred orientation of olivine. *Tectonophysics* 421, 1-22.