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Estimation of deformation environment of Asuke Shear Zone using pseudotachylyte and mylonite

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Brittle to ductile fault rocks such as cataclasite, pseudotachylyte and mylonite are distributed along the NE-SW trending Asuke Shear Zone in the Inagawa granite bodies of the Ryoke Belt, Chubu region. Movement sense of Asuke Shear Zone includes both sinistral and normal components (Sakamaki et al., 2006). In this study, we carried out (1) paleostress analysis using twined calcites that fill amygdules in pseudotachylyte and (2) estimation of deformation temperature based on crystallographic preferred orientations (CPO) patterns of quartz mylonites.

(1) There are many amygdules developed in the thick (about 11 cm) pseudotachylyte vein with zircon FT age of about 53 Ma taken at Taburi outcrop. The minerals filling the amygdales in this sample are mostly quartz and calcite, and planar deformation twin develop in many calcite. Deformation twin is shear deformation in the twin plane, and can be used to estimate the paleostress state like a fault. This method has been applied mainly on limestone, marble, calcite vein, and also on amygdules filled with calcite (Craddock and Magloughlin, 2005). This time, we estimated the paleostress state by means of Hough-transform-based multiple inversion method (Yamaji et al., 2006) application to 1491 sets of slip data measured from twinned calcite that filled amygdules (a part of results are already reported (Kanai and Takagi, 2014)). As a result, the stress states are consistent with the movement sense of Asuke Shear Zone.

(2) Fault vein and injection vein of the pseudotachylyte from Oshima outcrop has undergone a ductile deformation. C-axis CPO pattern of quartz from 4 sets of fault vein and injection vein of mylonitized pseudotachylyte were determined using SEM-EBSD method with a HKL Channel 5 EBSD system (Oxford Instruments). As a result, the CPO pattern in 3 samples of the fault veins show a Z-maximum pattern and in all 4 injection vein samples shows a random fabric.

Z-maximum CPO pattern suggests that the dislocation creep took place at less than 350-450 ℃, and random CPO pattern suggests that the deformation in the diffusion creep (Bouchez, 1977; Takeshita and Wenk, 1988; Sakakibara, 1995). From such CPO patterns and occurrence of mylonite, Asuke Shear Zone is considered to have received repeated deformation to form the pseudotachylyte and mylonite in brittle-plastic transition zone (300 - 400 ℃ in anhydrous conditions; Stockhert et al., 1999).

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