22-25 October
Seattle, Washington, USA
GSA 2017
THE GEOLOGICAL SOCIETY OF AMERICA®

386-9: DEFORMATION MECHANISMS OF QUARTZ AND PLAGIOCLASE IN A MID-CRUSTAL TRANSPRESSIONAL SHEAR ZONE WITHIN ARC CRUST: MICROSTRUCTURAL INVESTIGATION OF THE GREBE MYLONITE ZONE IN FIORDLAND, NEW ZEALAND

Wednesday, 25 October 2017
09:00 AM - 06:30 PM
Washington State Convention Center - Halls 4EF

We use electron backscatter diffraction analysis to interpret the deformation mechanisms of the rheology-controlling minerals within a transpressional shear zone developed within mid-arc crust. The Grebe Mylonite Zone (GMZ) in central Fiordland, New Zealand, is a mid-crustal shear zone developed within Carboniferous-age granite, tonalite, and diorite host rocks, and its association with voluminous, mid-crustal Separation Point Suite (SPS) plutons suggests a fundamental link between arc magmatism and shear zone deformation. We present data from two representative GMZ samples here: 17NZ95C1 (biotite diorite mylonite), and 17NZ96 (granite mylonite).

In both samples, quartz and plagioclase show contrasting amounts of crystal plasticity and LPO development. In 17NZ95C1, elongate plagioclase and biotite define the foliation, and the quartz is interstitial in nature; quartz displays some Dauphine twins and has slightly rounded to straight grain boundaries, and plagioclase exhibits some deformation twinning and rare lobate grain boundaries. In 17NZ95C1, plagioclase exhibits moderate LPO consistent with the {001} <100> slip system, and quartz has no LPO. In 17NZ96, quartz has Dauphine twins and has some irregular grain boundaries where pinned. Plagioclase porphyroclasts have some deformation twins, lack subgrain development, and are surrounded by elongate recrystallized grains without host control orientation relationships, suggesting limited crystal plasticity. In 17NZ96, plagioclase has a weak LPO that is inconsistent with the kinematic reference frame, and quartz has a moderate LPO indicating basal <*a*> slip.

The GMZ samples indicate strong compositional and textural controls on rheology. In the biotite diorite mylonite, an interconnected network of plagioclase controls the rheology due to the interstitial nature of the quartz grains within the fabric. In the granite mylonite, dislocation creep of quartz dominates the rheology due to limited crystal plasticity in plagioclase. These results suggest GMZ deformation temperatures near the onset of plasticity in feldspar (>500ºC), consistent with previous interpretations of the GMZ as a mid-crustal shear zone. These temperatures are low given the proximity of SPS plutons, suggesting minimal melt interaction with the GMZ mylonites.

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Final Paper Number 386-9
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Day: Wednesday, 25 October 2017

Geological Society of America Abstracts with Programs. Vol. 49, No. 6, ISSN 0016-7592
doi: 10.1130/abs/2017AM-307053