Geophysical Research Abstracts
Vol. 20, EGU2018-13476-2, 2018
EGU General Assembly 2018

The rheology of sheared myrmekite during mylonitization of a granitoid

Alberto Ceccato (1), Luca Menegon (2), and Giorgio Pennacchioni (1)

(1) University of Padua, Department of Geosciences, Padova, Italy (alberto.ceccato.2@studenti.unipd.it), (2) School of Geography, Earth and Environmental Sciences, Plymouth University, United Kingdom

Strain-induced replacement of K-feldspar by myrmekite is a very efficient reaction-softening mechanism in granitoids. We investigated the granitoid mylonites of the Rieserferner pluton (Eastern Alps), that underwent deformation at 420-460 °C during pluton cooling, to establish the mechanism of weakening associated with myrmekite development. Myrmekite development results in both grain size reduction and phase mixing as a consequence of heterogeneous nucleation of quartz and plagioclase. The grain size reduction promotes grain-size sensitive creep mechanisms such as diffusion-assisted grain boundary sliding in plagioclase. This process is coupled with heterogeneous nucleation of quartz in pores developed by creep cavitation of plagioclase + quartz aggregates. K-feldspar is occasionally re-deposited in strain shadows and creep cavitation pores due to precipitation from K-rich fluids.

Rheological flow laws have been calculated for pure quartz, pure feldspar, and plagioclase + quartz layers of the Rieserferner mylonites following Platt (2015). Results show that sheared myrmekite diffusion-assisted grain boundary sliding can accommodate strain rates up to four orders of magnitude higher than pure quartz layers deforming by dislocation creep. Rheological models for plagioclase + quartz and for pure feldspar aggregates show that strain rates of diffusion-assisted grain boundary sliding in the former are comparable to those of diffusion creep in the latter. Therefore, diffusion creep and grain-size sensitive processes play a key role during mylonitization and contribute significantly to bulk rock softening. Our results have strong implications for the definition of rheological models of K-feldspar-rich lithologies during deformation at mid-upper crustal conditions.