Geophysical Research Abstracts
Vol. 13, EGU2011-11887-1, 2011
EGU General Assembly 2011

The interaction of migrating grain boundaries and fluid inclusions in naturally deformed quartz

Joyce Schmatz and Janos L. Urai
RWTH Aachen, Geologie - Endogene Dynamik, Aachen, Germany (j.schmatz@ged.rwth-aachen.de)

We studied the microstructure of a folded and partly recrystallized quartz vein from the Hunsrück Slates in Germany, focusing on the morphology and distribution of fluid inclusions in the old and new grains and along the different types of grain boundaries. Blocky vein quartz grains show undulose extinction and develop subgrains. New grains form by subgrain rotation and grain boundary migration, with a bimodal size distribution.

The old, deformed grains contain numerous, complex, H2O-CO2-graphite inclusions, with significant differences in fluid inclusion setting along subgrain boundaries. The new grains have a lower content of H2O-rich inclusions than the old grains and do not contain graphite, and there is a significant difference in volume and density of fluid inclusions between the large and small new grains. Grain boundaries between old and new grains are irregular, containing similar fluid inclusions as the old grains, but no enrichment in graphite, while grain boundaries between new grains are smooth and can be inclusion free or contain arrays of fluid inclusions.

We interpret these structures to have formed by a series of complex interactions between grain boundaries migrating at different velocity and the fluid inclusions. Differences in mobility and grain boundary velocity can result in different variations of drag and drop- interaction, while chemical differences lead to phase separation during grain boundary-fluid interaction. Migration of grain boundaries into the old grains was accompanied by significant redistribution of fluids and graphite along the grain boundary together with oxidation of graphitic inclusions to CO2.