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# Low angle boundaries in dry quartz

R. Kilian (1), R Heilbronner (1), and H Stünitz (2)

(1) University Basel, Department of Geosciences, Basel, Switzerland (ruediger.kilian@unibas.ch), (2) Geological Institute, University Tromsø, Norway

The Truzzo Granite in the Central Alps (Italy), is heterogeneously deformed under amphibolite facies conditions. Quartz grains in polycrystalline aggregates are dynamically recrystallized and the microstructure is indicative of grain boundary migration recrystallization.
Fourier transform infrared spectroscopy (FTIR) reveals that quartz has a very low intracrystalline water content (< 100 H/10$^6$Si), which is comparable to that of Brazil quartz. Additionally, it is demonstrated that intragranular water (e.g. in fluid inclusions) is removed during grain boundary migration recrystallization.
There is clear evidence (CPO, SPO, grain size) that quartz deformed by dislocation creep at relatively low differential stresses. This is not to be expected in the light of the experimentally obtained knowledge about the mechanical behavior of dry quartz, which should be very strong and dislocation related processes should be difficult (e.g. Griggs & Blacic, 1964/5; Paterson, 1989).

Quartz grains show substructures, which are planar elements across which the crystal lattice changes its orientation. Some of planar elements are decorated with (partly solid) inclusions. Using a combination of EBSD-derived orientation data and light microscopy some of these planar elements can be identified as subgrain boundaries while in other cases a fracture origin cannot be ruled out. The planar defects indicate that under natural conditions a) dislocation climb is possible even in quartz with very low H-contents, and b) fracturing might also occur under low differential stress, high temperature conditions and result in substructures which very much resemble subgrain boundaries caused by dislocation processes.

References:
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