

Evidence of dislocation climb in naturally deformed quartz by electron tomography of dislocations

Timmo Weidner^a, Alexandre Mussi^a, Patrick Cordier^{a,b}

^aUniv. Lille, CNRS, INRAE, Centrale Lille, UMR 8207 - UMET – Unite Materiaux et Transformations, F-59000 Lille, France

^b Institut Universitaire de France, F-75005 Paris, France

^atimmo.weidner.etu@univ-lille.fr

In this study two naturally deformed (at upper Greenschist to Amphibolite conditions) quartz samples were analyzed for their dislocation microstructure using transmission electron microscopy. We used electron tomography of dislocations, with a method that only needs few projected images for 3D reconstruction so it can be used on beam-sensitive materials such as quartz [1]. The 3D characterization of the microstructure allows an accurate indexation of dislocation habit planes in addition to the standard Burgers vector characterization. Both samples showed similar dislocation microstructures. Beside the common glide systems $\langle a \rangle$ prismatic, $\langle a \rangle$ basal and $\langle a \rangle$ rhomb, we found glide in $\langle c + a \rangle$ prismatic and $\langle c + a \rangle$ pyramidal. In addition, we found evidence of pure climb of $\langle a \rangle$ dislocations and a high occurrence of mixed climb which is a mechanism not well described.

Keywords:

TEM; Tomography; Dislocation; Quartz; Climb

[1] Mussi, A., Gallet, J., Castelnau, O., Cordier, P., Application of electron tomography of dislocations in beam-sensitive quartz to the determination of strain components, Tectonophysics, 803, 2021, 228754.