Brittle versus crystalplastic deformation in intracrystalline shear bands in quartz

Derez, T[1], Pennock, G[2], Drury, M[2], Sintubin, M[1]

Tine.Derez@ees.kuleuven.be

[1]*KU Leuven, Leuven, Belgium*
[2]*Utrecht University, Utrecht, The Netherlands*

Several models exist concerning the formation of conjugate sets of intracrystalline shear bands in quartz: (1) initiation as microfractures parallel to the rhombohedral planes; subsequent shear activation causes passive rotation of brittle fragments, which are dynamically recrystallised afterwards; (2) kinking produced by basal slip, followed by polygonisation by subgrain rotation recrystallisation; (3) precursory Dauphiné twinning, followed by dynamic recrystallisation and grain boundary sliding in well-oriented twin domains.

These shear bands are commom in vein quartz in greenschist metamorphic metapelites of the High-Ardenne slate belt (Belgium, France, Germany). As the veins (de)formed in the semi-brittle regime, they are appropriate to study the relative importance of brittle and crystalplastic deformation in shear band development. This vein quartz is studied by an integrated approach using Hot-CL, SEM-CL and EBSD. Attention is paid to the relationship with other deformation features, as deformation lamellae and Dauphiné twins. Preliminary results, demonstrating the added value of the integrated approach, are discussed and compared to the different models described above.