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Quantification of Quartz Microstructures

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Quartz microstructure analysis based on classical optical microscopy, is appointing to the identification of features related with dominial quartz studies. Microstructural features defined in this study include the concepts of microstructures, microstructural elements, microstructural features, fabric elements, elementary textures, textural elements and textural features (e.g., Vernon, 1976 and Kosaka, 1980). Petrographic analysis was focused on the identification of quartz microstructures, such as intra-granular microstructures, inter-granular boundary, and their relation to the deformation mechanisms activated during a simple shear progressive deformation event. These structures were quantified following the methodology developed by Kosaka (1980). To ensure a random sampling, measurement points were picked from a standard grid that covers the total thin section area. A statistically significant number of points were analysed.

Three geometrical tools were used to apply the quantification to each textural domain: point counting, the line intersection method and window counting. Point counting was used to select grains, line intersections to quantify linear microstructures, and window counting to quantify microstructures based on spatial relationships between grains or within a selected grain. Each microstructural feature was determined in relation to the measured grain size. The low birefringence was controlled to avoid biases, such as the non-use of perpendicular sections to the optical axis.

The classification after Kosaka et al. (1999) was used to determine quartz internal deformation stages, and three main grain types of quartz were identified. Less deformed quartz shows simple patterns of undulose extinction, more complex based jigsaw ones, or chess-board and banded geometries. The second type includes quartz grains with large subgrains. Most deformed quartz grains include clusters of grains differentiated by their granular dimensions. In order to quantify boundary mobility, four textural states representing incremental degrees were defined: i) local bulging, ii) proto-subgrain rotation, iii) boundary grain migration and iv) jigsaw boundary geometry.

This methodology was applied on the petrographic study of internal shearband boudin microstructures related with a Variscan HT simple shear zone.

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