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Small scale shear zone in calcite: AMS and microstructure

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Two structural profiles across thin shear zone in calcite from quarry in Estremoz (Portugal) were studied to find a relationship between AMS and strain in natural rocks. The mesoscopic fabric is characterized by the change from the subhorizontal coarse-grained foliation towards the ∼2cm-wide shear zone center with subvertical fine-grained foliation.

In microstructure, the shear zone records dynamic recrystallization of calcite aggregate which resulted in development of porphyroclastic microstructure with increasing proportion of fine-grained recrystallized matrix towards the shear zone center. Two distinct crystallographic preferred orientations of calcite were recorded. One related with porphyroclasts, characterized by subvertical orientation of calcite <c> axes and another associated with recrystallized matrix showing subhorizontal calcite <c> axes orientation.

The magnetic susceptibility ranges from -8e-6SI to 9e-6SI, with the average -4e-6SI. The majority of the rock mass is diamagnetic, corresponding well with the thermomagnetic curves, with local paramagnetic accumulations in form of thin bands. The AMS of the both profiles exhibits stable subvertical foliation bearing vertical lineation which is locally alternated by the medium-angle foliation. We interpret the AMS fabric pattern which is perpendicular to the mineral one as a type of inverse AMS fabric, due to high iron content in major part of calcite grains

The magnetic and microstructural description of the shear zone is accompanied by numerical modeling of AMS based on CPO and different proportion of porphyroclasts, matrix and mica for purposes of deciphering the influence of present microstructural features on AMS.