



## **Textural evolution of plagioclase feldspar across a shear zone: Implications for deformation mechanism and rock strength**

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Caledonian amphibolite facies shear zones developed in granulite facies anorthosites and anorthositic gabbros of the Bergen Arcs, western Norway allow a detailed study of the relationships between fluid-infiltration, mineral reactions, the evolution of microstructure and deformation mechanisms. A sequence of rocks from the relatively pristine granulites into a shear zone has been studied by optical microscopy, EMPA, SEM, EBSD and TEM, focusing on the progressive development of microstructure in the plagioclase feldspars, leading up to their deformation in the shear zone. At the outcrop scale, fluid infiltration into the granulites is marked by a distinct colour change in the plagioclase from lilac/brown to white. This is associated with the breakdown of the intermediate composition plagioclase ( $\sim\text{An}_{50}$ ) in the granulite to a complex intergrowth of Na-rich and Ca-rich domains. EBSD analysis shows that this intergrowth retains the crystallographic orientation of the parent feldspar, but that the Ca-rich domains contain many low-angle boundaries as well as twin-related domains. Within the shear zone, this complex intergrowth coarsens by grain boundary migration, annihilating grain boundaries but retaining the Na-rich and Ca-rich zoning pattern. Analysis of nearest-neighbour misorientations of feldspar grains in the shear zone demonstrates that local crystallographic preferred orientation (CPO) is inherited from the parent granulite grain orientations. Random pair misorientation angle distributions show that there is no CPO in the shear zone as a whole, nor is there significant shape preferred orientation (SPO) in individual grains. These observations are interpreted in terms of fluid-induced weakening and deformation by dissolution-precipitation (pressure solution) creep.