

Connection between chemical zonation and microstructure as an indicator for the fabric development in eclogites

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Eclogites are the most important piece of evidence of high pressure conditions in subduction zones. The deformation of eclogites and the driving forces for their fabric development are an interesting topic potentially allowing to determine deformation rates in subduction zones. Most previous studies suggested dislocation creep to be the principal process causing the fabric development. The viability of this process may be tested by studying the chemical zonation of garnet and omphacite in order to track and quantify texture and microstructure development in eclogites. The aim of this study is to assess the influence of crystal growth on mineral preferred orientation and therefore its role in fabric development in eclogite-facies rocks. Caledonian, Variscan and Alpine eclogites from four different locations are studied, representing a wide range of metamorphic conditions as well as different subduction and exhumation rates.

Variscan eclogites from the western Bohemian Massif (Czech Republic) show elongated garnet grain shapes parallel to the rock's extension direction. Asymmetric chemical zoning developed during prograde garnet growth together with the elongated garnet grain shape and can be related to a corresponding prograde (in terms of pressure change) chemical zoning in omphacite grains. Crystal plastic deformation of garnet can be excluded based on chemical zonation patterns.

Preliminary results of chemical, microstructural and texture data indicate a direct relationship between the growth of garnet and omphacite grains with fabric development during prograde and peak metamorphic conditions. A later stage of retrogression observed along garnet and omphacite grain boundaries produces mineral phases with an orientation clearly parallel to the prograde fabric orientation.

The results will be compared with those of Caledonian eclogites from the Western Gneiss Region and the Tromsø Nappe (southwestern and northern Norway, respectively), as well as with Alpine eclogites from the Tauern Window (Eastern Alps, Austria) to assess the importance of orientated crystal growth as a contributing factor to the fabric development under eclogite-facies conditions.