

SCHMID, S., BERNOULLI, D., FÜGENSCHUH, B., MATENCO, L., SCHEFER, S., SCHUSTER, R., TISCHLER, M., USTASZEWSKI, K. (2008): The Alpine-Carpathian-Dinaridic orogenic system: correlation and evolution of tectonic units. - *Swiss Journal of Geosciences*, 101: 139-183.

## **Quartz vein formation during decompression and recrystallization in the Venediger Nappe Complex and Eclogite Zone of the southern Tauern Window (Eastern Alps): Fluid Inclusions linked with structures**

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The Variscan Basement (Venediger Nappe Complex) and the Eclogite Zone are parts of the Subpenninic Units of the Tauern Window in the Eastern Alps. The investigated area, located in the southern Tauern Window along the Frosnitzal (Eastern Tyrol), shows asymmetric domino boudin structures with quartz-filled vein necks within the Venediger Nappe Complex. The amphibolite host rocks are surrounded by a layered penetrative foliation consisting of leucocratic melts (leucosomes) which can be linked with the Permian-Carboniferous intrusion of the Zentralgneis. Quartz samples are taken from the leucosomes and from the boudin neck structures.

In the Eclogite Zone concordant quartz layers occur beside carbonate-bearing micaschists and a penetrative foliation consisting of omphacite + garnet + epidote/zoesite + glaucophane. Three generations of fluid inclusions have been distinguished. On the basis of the textural occurrence and rheological characteristics, the chemistry of the metamorphic fluid during recrystallization of the leucosome layers and quartz-filled vein neck formation is reconstructed. It can be shown that during recrystallization and decompression the grade of salinity increases from about 6 to 15 mass% accompanied with a small change in the aqueous system  $\text{H}_2\text{O}-\text{NaCl}-\text{MgCl}_2\pm\text{CaCl}_2$ . This change occurred at estimated maximum P conditions around 850 MPa and temperatures of 500-550°C (fluid inclusion generation 1). Subsequent healing of micro-cracks postdates recrystallization in the range between 600 and 350 MPa (fluid inclusion generation 2). Restricted to the boudin necks a late fluid generation of primary character consisting of  $\text{CO}_2-\text{H}_2\text{O}-\text{NaCl}$  chemistry indicates entrapment conditions between 250-300 MPa which is linked with a late stage quartz vein precipitation in the boudin necks (fluid inclusion generation 3). These late veins are not recrystallized and contain conjugate microcracks that are different to earlier cracks which healed in recrystallized quartz aggregates (intragranular versus transgranular plane characteristics). In this late quartz vein generation fluid inclusion decrepitation features indicate isobaric cooling at the latest stage of the PT-evolution of the Venediger Nappe Complex.

Fluid Inclusions from a concordant folded quartz layer in the Eclogite Zone are compared to the fluids in the Venediger Nappe Complex but significantly different in their chemistry and densities. They are dominated by the  $\text{N}_2-\text{CH}_4-\text{H}_2\text{O}$  system and texturally arranged along intragranular planes within totally recrystallized quartz grains. The fluid chemistry of ca. 90 mol%  $\text{N}_2$  can be related to the breakdown of K-bearing minerals like feldspar and mica during retrogression of the eclogitic host rock. Additionally a rare occurrence of pure aqueous inclusions is observed along cracks. Calculated low densities are indicative for reequilibration and leakage due to decompression and recrystallization.