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Pre-Alpine and Alpine microfabrics in the Austroalpine crystalline basement (Matsch Unit, Italy)

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The Matsch Unit is part of the Austroalpine crystalline basement of the Eastern Alps. Three distinct tectonometamorphic events have been recognized in this unit. These include Variscan amphibolite-facies metamorphism, a Permian low-pressure event related with pegmatite emplacement and a Cretaceous greenschist-facies metamorphic overprint (Haas, 1985; Habler et al., 2009). The Cretaceous „Vinschgau Shear Zone“ representing the southern tectonic boundary of the Matsch unit is supposed to show an increase in shear zone width and metamorphic grade from W to E (Schmid & Haas, 1989; Froitzheim et al., 1997). Cretaceous deformation in the Matsch crystalline complex was typically restricted to distinct shear zones, especially at subunit boundaries as well as at the northern and southern margin of the Matsch unit.

The current study is focused on comparing deformation and reaction microstructures in high- and low-strain domains of Cretaceous deformation affecting Permian pegmatites and their metapelitic host rocks from the eastern portion of the Matsch unit.

A major challenge was the discrimination of Cretaceous and pre-Cretaceous microfabrics. Remarkable differences of heterochronous deformation stages are reflected by the deformation and recrystallization behaviour of quartz, feldspar, biotite and white mica as well as characteristic syn-tectonic phase assemblages that replaced Variscan and Permian parageneses in peraluminous metapelites.

Pre-existing staurolite was decomposed to chloritoid and paragonite, whereas a second garnet generation grew at the expense of biotite. Furthermore, biotite fishes were marginally decomposed to aggregates of white mica and ilmenite. This reaction was also observed at kink bands within biotite clasts.

Cretaceous quartz microfabrics imply dynamic recrystallization by subgrain rotation (SGR) and grain boundary migration (GBM) associated with the development of a strong lattice preferred orientation (LPO). Subsequently, bulging recrystallization (BLG) occurred during successive later stages of the Cretaceous tectonometamorphic event. Presumed pre-Cretaceous quartz microfabrics show medium to coarse grained recrystallization without preserving a clear LPO. Plagioclase microstructures in Cretaceous high-strain domains point to dissolution-precipitation and bulging recrystallization. Plagioclase precipitation in strain shadows of relict feldspar clasts in metapelites obviously occurred at conditions of the peristerite gap (Habler et al., 2009). Bulging recrystallization of feldspar is often restricted to discrete zones within large feldspar grains, sometimes associated with crystallization of white mica.

In contrast, microfabrics in the quartzofeldspathic matrix of some pegmatites point to dynamic recrystallization of feldspar by SGR recrystallization and thus indicate T-conditions of deformation exceeding those expected for the Cretaceous tectonometamorphic event.

Based on detailed microstructural and mineral chemical data future research will aim on the investigation of the effects of Cretaceous deformation on the Rb-Sr isotopic system of biotite, white mica and feldspar in these rocks, in order to contribute to a better understanding of the interrelation of strain and isotopic re-equilibration in deformed, polymetamorphic rocks.

References

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