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DOMAIN FORMATION IN A STAUROLITE-KYANITE AMPHIBOLITE OF THE SCHNEEBERG COMPLEX, SOUTHERN TYROL: APPLICATIONS OF THERMOBAROMETRY TO LOCAL EQUILIBRIUM DOMAINS

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Within the Paleozoic Austroalpine Schneeberg Complex, unusual Al-rich staurolite-bearing assemblages occur. These assemblages form within the contact between calcite marble, interlayered calc-micaschists and amphibole-bearing metamarls.

In one of these localities, the assemblage staurolite + Ca-amphibole was found within a garnet amphibolite sample containing the assemblage staurolite + Ca-amphibole + margarite + kyanite + clinozoisite. Careful textural examination revealed that Ca-amphibole and staurolite are part of entirely different kinds of domains: staurolite occurs within Al-rich domains in the assemblage staurolite + margarite + kyanite + clinozoisite/epidote + plagioclase + biotite + muscovite without quartz, while Ca-amphibole is confined to Al-poor domains containing the assemblage Ca-amphibole + calcite + clinozoisite/epidote + biotite + plagioclase + quartz. Although both assemblages occur within a thin section, they show different reaction histories. The Al-poor domains are characterized by the breakdown of the assemblage Ca-amphibole + muscovite according to the model reaction in the system KCMASH: 5muscovite + 3tremolite $\Leftrightarrow$ 2clinozoisite + 5phlogopite + 2anorthite + 14quartz + $2H_2O$. The Al-rich domains show an equilibrium assemblage containing margarite + kyanite + plagioclase + clinozoisite/epidote, which probably developed by a complete consumption of quartz.

P-T-a(H_2O) estimates of sample K34 were calculated with the program THERMOCALC v 2.7. with the thermodynamic data base of HOLLAND & POWELL (1998). Within the assemblage zoisite + clinozoisite + margarite + kyanite in the Al-rich domain, several reactions can be calculated. Since no quartz is present in this domain anymore, a quartz-absent invariant point can be calculated involving the reaction kyanite + zoisite/clinozoisite $\Leftrightarrow$ anorthite + margarite and the transition reaction zoisite $\Leftrightarrow$ clinozoisite. These calculations yields 9.3 $\pm$ 0.5 kbar and 569 $\pm$ 24°C for the Al-rich domain of sample K 34. The a(H_2O) from this sample has also been estimated by calculating a P-a(H_2O) diagram, after estimating the P-T conditions with the H_2O-independent reactions as discussed above. For these claculations, muscovite and biotite were also added to the calculations. The resulting a(H_2O) is low and ranges from 0.39 to 0.47 at pressures between 9.3 and 9.5 kbar.

Application of WEBINVEQ thermobarometry (GORDON, 1992) to the adjacent rocks yields pressures of 8 - 10 kbar at temperatures of 540 - 590°C. These high pressures may be interpreted in favour of an overall pressure increase of the Eo-Alpine metamorphism from NW towards SE within the Ötztal-Stubai Crystalline Complex, culminating in the formation of Eo-Alpine eclogites in the southwest of the Schneeberg Complex (HOINKES et al., 1991).

References

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