

TWO PHASE GARNET GROWTH IN VARISCAN MIGMATITES FROM THE BAVARIAN UNIT, UPPER AUSTRIA

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Outcrops of garnet bearing cordierite migmatites are found mainly along the Danube valley west of Linz. The common formation of migmatites with well-developed leucosomes (K-feldspar, plagioclase, quartz) and melanosomes (garnet, cordierite, sillimanite, spinel, ilmenite, ± biotite) indicate high temperature metamorphism. Most of the scarce garnets are characterized by a homogenous iron rich composition ($X_{\text{alm}}=0.78-0.80$), moderate pyrope contents ($X_{\text{prp}}=0.16-0.18$) and minor amounts of grossular and spessartine components ($X_{\text{grs}}=0.028-0.032$, $X_{\text{sps}}=0.020-0.024$). Large garnet porphyroblasts display an elevated Ca-plateau ($X_{\text{grs}}=0.053-0.055$) and a slightly increased spessartine component ($X_{\text{sps}}=0.030-0.035$) in the cores followed by a decrease towards the rim (Figure 1 A). The change in garnet composition from core to rim is directly related to a change in P and T conditions. Mineral inclusions in garnet cores (biotite+plagioclase+spinel+quartz+ilmenite±rutile±staurolite±corundum) are different to matrix minerals and support the two stage metamorphic history. Multi equilibrium thermobarometry using winTWQ Version 2.34 (BERMAN, 1991) allowed to constrain metamorphic conditions of 850-900°C and 0.55-65GPa for matrix and garnet rim composition (Figure 1 B). Geothermobarometric calculations using inclusions in garnet cores yielded P/T conditions of 600-650°C and 1.0-1.2GPa (Figure 1C). Calculated pseudo-sections using garnet core and rim compositions were used in addition to better constrain the P-T evolution where a medium T/high P metamorphic stage was subsequently followed by the well-established high T/low P stage, commonly found in the Bavarian unit (TROPPEL et al., 2006).

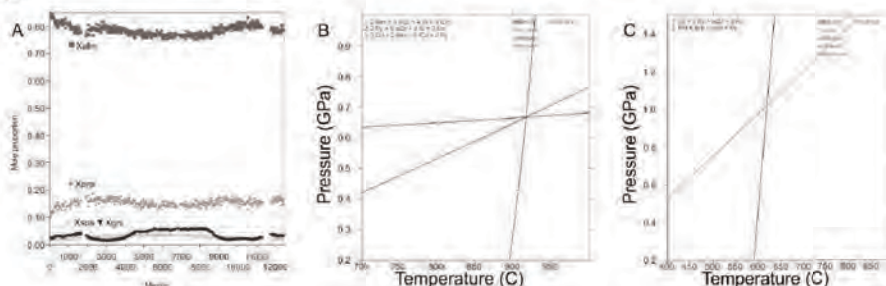


Figure 1. A) Chemical profile through a 12mm large garnet porphyroblast displaying an elevated Ca plateau in the core. B) Geothermobarometric calculations using the reaction $\text{Grt}+\text{Sil}+\text{Qz}=\text{Crd}$ to obtain matrix P/T conditions. C) Geothermobarometric calculations using GASP barometer and Grt-Bt thermometer to obtain metamorphic conditions for garnet cores.

BERMAN, R.G. (1991): *Canadian Mineralogist*, 29, 833-855.

TROPPEL, P., DEIBL, I., FINGER, F., KAINDL, R. (2006): *Intern. J. Earth Sci.*, 95, 1019-1037.