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INTERNAL MICROSTRUCTURES AND BREAKDOWN OF GARNET FROM MOLDANUBIAN GRANULITES (GFÖHL UNIT, DUNKELSTEINER WALD, NIEDERÖSTERREICH)

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Some conspicuous symplectite-bearing granulite-facies rocks from the Moldanubian Gföhl Unit show an unusual bulk composition with very high Mg and Ca contents and 14mole% normative corundum. They contain garnets (X_{Pyr}>0.55), clinopyroxene (X_{Di}>0.7; X_{CaTs}>0.2), pargasitic hornblende, and plagioclase (X_{An}>0.75). The primary microstructure is granular and well equilibrated.

Garnets of about 2cm size are common. Often they are resorbed and thus significantly smaller. The garnets show internal deformation which is expressed by non-coaxial strain around a common rotation axis approximately parallel to [211] of the garnet lattice of the different domains. From crystal orientation imaging incipient polygonalization of garnet during crystal plastic deformation under high-grade metamorphic conditions is inferred.

Along garnet margins and within cracks, various replacement symplectites were formed comprising distinct assemblages of orthopyroxene+spinel+anorthite±Al-rich amphibole± tschermakitic diopside±sapphirine±corundum. Symplectite formation was probably induced by decompression and fluid input. The last peak metamorphic conditions of the Gföhl Unit has been estimated in previous studies with pressures and temperatures around 0.8-1.1GPa and 700-800°C. The rocks then experienced isothermal decompression followed by isobaric cooling down to 0.5-0.6GPa (PETRAKAKIS, 1997). The temperature during the formation of the symplectites has been estimated using Grt-Opx- and Grt-Cpx-thermometry and resulted in values of approx. 700°C for the pressure-range of 0.5-0.6GPa, indicating essentially isothermal decompression.

Towards the interface with the symplectites, garnets show secondary diffusional zoning, which is most likely related to symplectite formation. This zoning is characterized by increasing Fe and decreasing Mg towards the garnet rim and can be used for geospeedometry modelling. Diffusion modelling yields a time interval for symplectite formation of about 1000 years, which thus represents an ephemeral episode during decompression within the geological time frame. Preservation of the delicate symplectite microstructures and the lack of penetrative deformation are consistent with isobaric cooling at 0.5-0.6GPa as suggested earlier.

PETRAKAKIS, K. (1997): J. Metam. Geol. 15, 203-222.