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Petrology of variscan low-pressure granulites and migmatites from the Moldanubian Superunit, Upper Austria

SORGER, D.[1], HAUZENBERGER, C.[1], LINNER, M.[2], IGLSEDER, C.[2]

[1] University of Graz, Institute of Earth Sciences, NAWI Graz, Universitätsplatz 2, 8010 Graz, Austria
[2] Geological Survey of Austria, Neulinggasse 38, 1030 Vienna, Austria

The investigated low-pressure granulite facies rocks from the Danube valley (west of Linz), Mühlviertel area (northwest of Linz) and Sauwald area (south of the river Danube) represent characteristic migmatic paragneisses of the Bavarian Unit, the part of the Moldanubian Superunit with a late low-pressure/high-temperature overprint. Most of these rocks underwent high degrees of melting forming meta- and diatexites ("Perlgneise"). Al-rich metapelitic migmatites (cordierite-garnet-sillimanite-granulites) with partly cm-sized garnet porphyroblasts can be found in some localities of this unit.

The migmatic paragneisses and the cordierite-garnet-sillimanite-granulites as well as some mafic granulites were used for geothermobarometry. Metamorphic conditions of around 770°C to 850°C and 0.5 to 0.6 GPa were obtained. Particularly the cordierite-garnet-sillimanite bearing felsic granulites were used to calculate pseudosections for determining the P-T evolution of the granulites. The consumption of garnet and formation of cordierite, sillimanite and spinel is compatible with temperature increase at near constant pressure. Peak conditions are around 750°C to 850°C and 0.4 to 0.6 GPa.

A sample with large garnets displaying conspicuous zoning was investigated in detail. A chemical zoning profile across the ca. 6 mm large garnet displayed elevated Ca-Mn-contents (Xgrs=0.23, Xsps=0.12) in the central part which decreased continuously towards the rim to Xgrs=0.03 and Xsps=0.02. Almandine and pyrope components in the core are 0.60 and Xprp=0.03, respectively and increase towards the rim to Xalm=0.85, Xprp=0.10 which is opposite to the grossular and spessartine components. Most of the smaller garnet grains in other samples have a homogeneous almandine rich composition. They display a single-phase growth, a slightly increase of iron and decrease of magnesium at the rim typical for retrograde diffusion zoning during cooling.