DOLOMITIC MARBLES FROM ORGANI AREA IN THE EASTERN RHODOPE ULTRAHIGH-PRESSURE METAMORPHIC TERRANE, NE GREECE

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Dolomitic marbles are interbedded with migmatitic gneisses in the Organi area of the Kimi ultra-high pressure (UHP) metamorphic complex in Greek Eastern Rhodope. The marbles have the mineral assemblage: Cal + Mg-Cal + Dol + Ca-Dol + Ol + Di + Spl + Phl ± Hbl + Ti-Chu + Chl + Srp. Diopside, spinel, phlogopite and pargasitic hornblende are present in minor amounts. Ti-clinohumite, chlorite and serpentine are products of retrograde hydration metamorphism replacing olivine, spinel and phlogopite.

Calcite and dolomite are compositionally heterogeneous, widely ranging in compositions. Compositions in calcite range from almost pure calcite to Mg-calcite with X_{MgCO_3} = 0.13 mol, and in dolomite from pure dolomite to Ca-rich dolomite with X_{MgCO_3} = 0.34 mol. Within a single Mg-calcite grain there are domains of low Mg-calcite (X_{MgCO_3} = 0.00 to 0.03 mol) that are rich in Ca-dolomite inclusions (X_{MgCO_3} = 0.34 to 0.47 mol), and domains of high Mg-calcite (X_{MgCO_3} = 0.10 to 0.13 mol) that are free of inclusions. Calcite-dolomite geothermometry gives a temperature of 1085 °C from the Ca-rich dolomite with X_{MgCO_3} = 0.36 mol and 740 °C from the inclusion free homogeneous Mg-calcite domains with X_{MgCO_3} = 0.13. Textural relationships indicate that the Ca-dolomite inclusions and the low Mg-calcite host are decomposition products of the homogenous high Mg-calcite. The inclusion free domains are relics of the high Mg-calcite, that probably record peak temperatures (~740 °C) of a primarily low to medium pressure metamorphism. Assuming that pure calcite and low Mg-calcite was former aragonite, the association of these phases with Ca-rich dolomite indicates a subsequent UHP-UHT metamorphism for the Organi marbles, like that documented in the neighbouring diamondiferous metapelites.

Minimum pressures of 5 GPa are constrained from graphite-diamond transformation for temperatures of 1085 °C. At 6 GPa, the most Ca-rich dolomite (X_{MgCO_3} = 0.34) inclusions in low Mg-calcite (former aragonite), plot on the dolomite limb of the aragonite-dolomite solvus (BUOB et al., 2002) at 1150 °C. Peak P-T conditions did not cross the reaction curve Arg + Dol→ Mg - Cal. Calculated eutectoid composition of Mg-calcite has X_{MgCO_3} = 0.25 mol at 6 GPa and 0.30 mol at 8 GPa. Mg-calcites with X_{MgCO_3} ranging from 0.25 to 0.30 mol are not present in the dolomitic marbles. Peak P-T conditions for the UHP metamorphism are constrained within the aragonite + Ca-dolomite stability field with most realistic values ~6 GPa and ~1150 °C.

References

BUOB, A., ULMER, P., LUTH, R. & TROMMSDORFF,V (2002): Experimental data at 6 GPa on the system $CaCO_3$-$MgCO_3$ and a thermodynamic model of the solid solution. J.Conf.Abs., EMPG IX, 7,1, 20.