Petrology of marbles from the Arda tectonic unit, Central Rhodope, Bulgaria

Петрология на мрамори от тектонската единица Арда, Централни Родопи, България

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Marbles often constitute considerable parts of metamorphic sequences or variegated formations. In the Rhodope massif, their petrology and geochemistry remain poorly known. Information for mineral composition of metacarbonates appeared in papers dedicated to regional geology and impresses with numerous mineral species reported, although lacking any information for mineral equilibriums and paragenesis. Cherneva et al., (2003) shortly discussed chemical composition of marbles in the same area. Recently, detailed data on petrology and mineral chemistry of forsteritic marbles from Chepelare area gave Stavrakeva and Petrusenko (2005). In this study we report new data on petrology and mineral chemistry and make first attempt for thermobarometry of metacarbonates from the deepest part of the Central Rhodope metamorphic complex, where their spatial distribution is related to the variegated succession known as Chepelare mйlange (Sarov et al., 2007).

Field observations and petrography

Within the Chepelare mélange zone metacarbonates crop out as mid- to coarse-grained lenses and bands blocks with massif, weekly deformed or banded texture and thickness up to 20 m. They associate with migmatitic garnet-kyanite gneisses, amphibolites, two mica gneisses and lenses of serpentinised ultrabasic rocks. In the field, dominate white or grey pure marbles containing also minor micas, quartz, feldspars, diopside, tremolite, titanite, apatite, zircon and graphite. Calcite is the main carbonate mineral. It forms isometric or slightly elongated to the foliation xenoblasts with varying size and irregular grain boundaries. The presence of dolomite is restricted to single outcrops. It forms big hypidioblastic to xenoblastic grains (~ 1 mm) hosted by fine-grained calcite-dominated matrix.

Impure marbles appeared as greenish layers, with variable content of silicates (15–45 vol.%). Major minerals are calcite, diopside, scapolite, K-feldspar, plagioclase and quartz, with minor phlogopite, epidote, allanite, tremolite, titanite, apatite and opaques. Diopside and scapolite are present in variable proportions and generally have a similar grain size, although in some samples, pyroxene forms large porphyroblasts (up to 1 cm). Diopside envelopes or includes scapolite, K-feldspar, calcite and quartz. Scapolites associate spatially with epidote and plagioclase, with rare inclusions of calcite, K-feldspar, quartz and diopside. Intergrowth of large scapolite and epidote suggests scapolite formation at expense of epidote. K-feldspar commonly forms xenoblastic to big hypidioblastic grains in association with diopside, scapolite and plagioclase. In studied samples, plagioclase is scarce and frequently includes epidote grains. Phlogopite forms hypidioblastic to idioblastic, weekly-deformed flakes, located along cracks and as small inclusions in calcite and plagioclase. Tremolite overgrows partly or completely diopside, including pyroxene relicts. Retrograde reaction textures with formation of acid plagioclase bands and domains are observed on silicates-calcite and two feldspars boundaries. We interpret calcite-diopside-scapolite-K-feldspar-quartz-titanite as equilibrium mineral paragenesis. Subordinate presence of plagioclase and epidote is related to scapolite formation. Phlogopite spatially related to cracks and tremolite are formed during the retrogression.

Mineral chemistry and thermobarometry

Calcite in pure marbles has low $MgCO_3$ content (1.65 to 3.18 wt.%). The matrix calcite in dolomite-bearing marbles has similar composition ($MgCO_3$ 2.22–5.50 wt.%), but calcite inclusion in *dolomite* ($MgCO_3$