High Pressure and Low Temperature Metamorphism along the North-Eastern Margin of the Bohemian Massif

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Several occurrences of high-pressure low-temperature rocks are known from the northern and western margins of the Bohemian Massif. They form a discontinuous belt rimming the Krkonoše-Jizera complex from east and south and occur also in the Krušné hory Mts. In the later, only relicts of blue amphibole with phengite and stilplomelane were found in metabasites (Holub and Souček, 1994).

The largest metabasite body with relicts of blueschist-facies assemblage (blue amphibole + epidote + albite + white mica) occurs in the Rýchory Mts. (Patočka et al. 1996). The presence of blue amphibole was reported also from Železný Brod, Roprachtice and Těpeře (Fediuk 1962, Cháb and Vrána 1979, Guiraud et al. 1981). We studied mafic and phyllitic rocks from three localities (Železný Brod, Roprachtice and Rýchory) including some rocks from nearby basement units. The rocks are strongly retrogressed into greenschist facies assemblages. Only primary basalts or gabbros may have glaucophane and/or sodic pyroxene. Blueschist facies assemblages in metabasite involve one or more of the minerals: blue amphibole, epidote, albite, chlorite, aegirine, epidote and titanite. Surrounding phyllitic rocks contain porphyroblasts of Fe-rich chloritoid in very fine-grained matrix composed of white mica, quartz and chlorite. Some chlorite forms small porphyroblasts with interlayers of white mica.

Amphibole composition ranges between sodic and calcic amphibole. Some blue amphiboles reveal a continuous decrease of Na and Al and increase of Ca towards rim. This suggests equilibrium condition between these two amphiboles that was reached after peak pressure during metamorphism. Blue amphiboles have composition ranging from glaucophane to riebekite with $X_{Al}=0.26$ to 0.88 and $X_{Mg}=0.4–0.7$. Calcic amphibole corresponds to actinolite. Analyzed sodic pyroxene is rich in aegirine (Di_{43-48}, Aeg_{40-45}) with low jadeite content (Jd_{8-12}). It was found in metagabbro, where it replaces primary igneous pyroxene. Epidote is rich in Fe ($X_{Al}=0.656$ to 0.886). Accessoric biotite has $X_{Mg}=0.535–0.699$ and chlorite $X_{Mg}=0.37–0.622$. Garnet associated with blue amphibole was reported only from the Kopina Hill in the Rýchory Mts. in Poland (Patočka et al. 1996).

Considering the blueschist classification of Evans (1990), PT conditions of the studied rocks correspond to low-temperature part of epidote blueschist facies. Textural relations indicate heating and decompression to greenschist facies that resulted in formation of actinolite, biotite, albite and chlorite.

Pelitic rocks from adjacent basement units are characterized by greenschist facies to lower amphibolite facies assemblages. Most of these rocks contain porphyroblasts of albite that enclose older foliation. In one case a garnet- and chlorite–rich sample with relicts of amphibole was found. Garnet is rich in Fe (Alm_{67-72}, Grs_{27-32}, $Py_{1.2-2.3}$, $Sps_{1.2-2.5}$) and amphibole corresponds to taramite (Si = 6.1 a.p.f.u.) with $X_{Mg}=0.34$ and $X_{Na}=0.31$, where B site is occupied by 0.508 a.p.f.u. Chlorite ($X_{Mg}=0.38$) is always a retrograde phase in the rock. Temperatures calculated using garnet amphibole thermometry of Graham and Powell (1984) are 398–410 °C. The presences of sodic-calcic amphibole as well as of porphyroblast of albite suggest medium- to high-pressure conditions of basement rocks. However the relation to the blueschist event is not clear yet.

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