Microstructural development of prograde metamorphic sequence from Mt. Papuk (Croatia)

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The metamorphic rocks of the western Mt. Papuk (Slavonian Mts., Croatia) belong to "Progressively Metamorphosed Complex" which grades continuously from low-grade rocks into migmatites and granitoids formed during the Variscan orogeny (Pamić & Lanphere, 1991). With pioneering work of Raffaelli (1964), a complete sequence of index minerals characteristic for Barrovian-type metamorphism was determined.

In this research, geological profile cutting through metamorphic rocks pertaining to characteristic metamorphic zones in the SW Papuk is re-examined and focus is put not only on the index-minerals, but also on prograde mineral assemblages and microtectonical properties of the schists and gneisses.

The southernmost positioned samples, i.e. low-temperature ones, show uniform mineral composition, consisting of Na – plagioclase (albite), quartz, chlorite, muscovite and biotite, representing the schists characteristic for biotite zone of the profile (Fig. 1.).

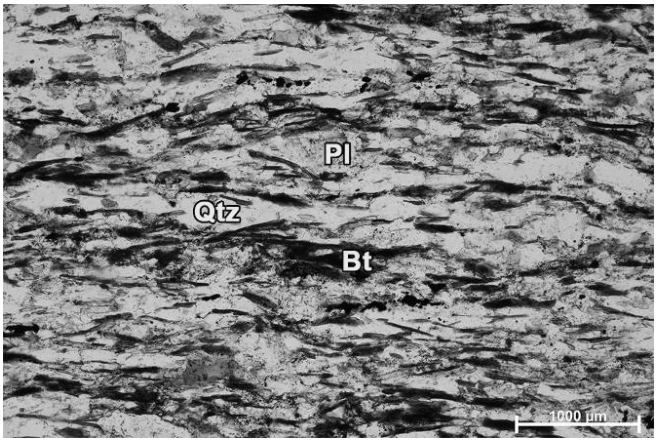

Figure 1. Low-temperature zone of the profile (i.e. biotite zone) of the geological profile cutting through metamorphic rocks, with an accent on mineral assemblage, PPL, N-, Qtz = quartz, Pl = plagioclase, Bt = biotite

The microtextures are characterized by fine-grained spaced schistosity with visible crenulation. Cleavage domains are dominated by muscovite, biotite and chlorite, while microlithons consist of feldspar and quartz, displaying a grain boundary migration as a consequence of dynamic recrystallization.

Toward north the schists grade into the garnet zone, characterized with the appearance of red garnet and the absence of chlorite (Fig. 2.). Recrystallization continued causing the change in the type of foliation from spaced to continuous, while crenulation remained. The increase in temperature is shown as the grain boundary area reduction development in quartz and plagioclase grains.

The zone with highest metamorphic grade determined in this research is the one containing staurolite. The modal composition of gneisses is somewhat changed, therefore no significant amount of muscovite can be found and volume percentage and An content of plagioclase is slightly increasing, as well as volume percentage of quartz.

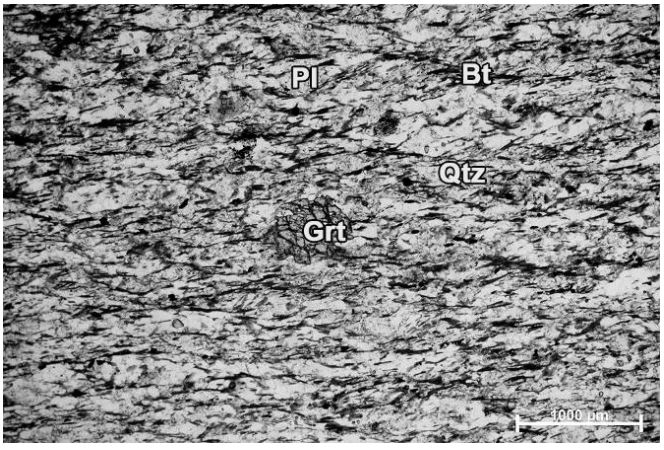

Figure 2. Mineral assemblage of the garnet zone in the researched profile is characterized with occurrence of red garnets, PPL, N-, Grt = garnet

Microtectonically, it is similar to the samples from garnet zone, showing continuous foliation, though in this sample with an absent crenulation and grain boundary area reduction (Fig. 3.). There are two types of opaque minerals visible in all of the samples, represented by hematite and pyrite.

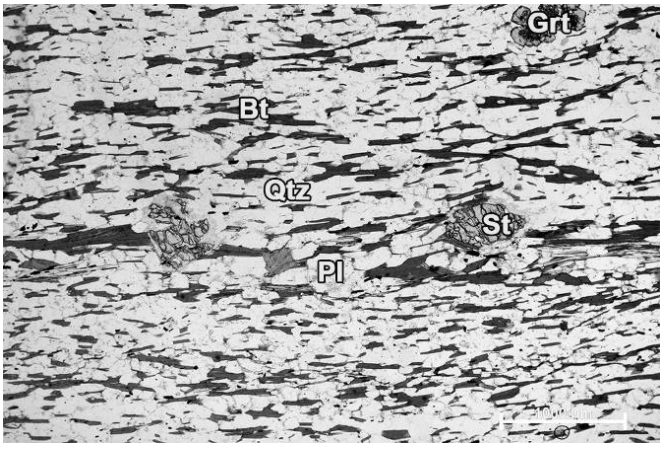

Figure 3. Staurolite zone of the profile developed in gneiss, PPL, N-, St = Staurolite

The investigated samples represent a part of a prograde metamorphic sequence developed in a uniform pelitic protolith, grading from biotite to staurolite zone. Metamorphic zones are regularly distributed from the southern margin to the core of the Mt. Papuk. Observed microtextures follow general prograde character of metamorphism.

Pamić, J., Lanphere, M. (1991): Geol Ljubljana, 34: 81-253
Raffaelli, P. (1964): Geol vjesnik, 18: 61–111