Abstract

The aim of the dissertation is to reconstruct tectonometamorphic evolution of the Kamieniec Metamorphic Belt (abbreviated as PKZ). It is composed of a metamorphosed volcano-sedimentary supracrustal sequence located in the NE part of the Bohemian Massif in the Fore-Sudetic Block. The supracrustal sequence of the PKZ was deformed and metamorphosed in the Variscan collision zone between the Saxothuringian and Brunovistulian terranes. The PKZ is built mainly of mica schists interlayered with quartzo-feldspathic schists, and subordinately quartzo-graphite schists, metabasites and marbles. So far in the mica schists exposed in the PKZ no record of high pressure/low temperature metamorphism (HP/LT) was described in spite of recognition of lawsonite pseudomorphs preserved in some garnet porphyroblasts. Furthermore, the detailed studies on tectonometamorphic evolution of the PKZ were published more than 20 years ago. However, since then new research techniques in the field of petrology and microtectonics were proposed and, therefore, I found the PKZ to be an interesting object of research.

During the fieldwork I documented tectonic mesostructures in 71 rock exposures covering the whole PKZ. I divided the tectonic mesostructures into corresponding deformation stages D_1, D_2 and D_3. Furthermore, I have carried out a detailed analysis of tectonic microstructures preserved in rock samples of dominant lithological varieties of the PKZ, i.e. coarse- and fine-grained mica schists and quartzo-feldspathic schists. I paid special attention to quartz grains preserved in numerous quartz aggregates of the studied rock samples. Analysis of the preferred crystallographic orientation of quartz (CPO) allowed for a detailed description of the kinematics of consecutive deformation stages. Detailed investigations of mica schists have also allowed for petrographic characterisation of the inspected rock samples and the identification of mineral parageneses stable during successive stages of metamorphism and deformation. Detailed studies of chemical composition of minerals were carried out for 15 samples of mica schists. Using petrographic observations, SEM images and chemical compositions of minerals I recognized two mineral parageneses M_1 and M_2 stable during consecutive episodes of metamorphism. Using conventional geothermobarometry the P and T conditions of M_1 and M_2 metamorphism was determined. This was followed by detailed thermodynamic modelling performed for two selected samples. This analysis included mainly modelling of P-T conditions of garnet crystallization.

The results of the conducted studies made it possible to present a new model of tectonometamorphic evolution of the eastern part of the Fore-Sudetic Block, which is

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presented for the first time in the context of collision of the Saxoturingian and the Brunovistulian terranes. The studied rock samples of the PKZ bear the record of two contrasting, in terms of P and T conditions, episodes of metamorphism M_1 and M_2. The P and T conditions during the M_1 metamorphic episode were at 15-21 kbar and 470-520°C, respectively, and were associated with the burial of the PKZ rock sequence into the subduction zone. The P and T conditions of the M_2 metamorphic episode, on the other hand, were at 3-7 kbar and 480-600°C and were associated with the final stage of exhumation of the PKZ. The documented deformation structures D_1 - D_3 were formed during the burial and subsequent exhumation of the PKZ. The deformation stage D_1 probably took place during the burial of the PKZ in the subduction zone, as indicated by the S_1 foliation defined by minerals belonging to the high-pressure paragenesis M_1. The D_2 deformation stage was responsible for the exhumation of the PKZ rock complexes, as well as for their shortening in the E-W direction that was associated with folding. The D_2 deformation stage began under high-pressure conditions, as indicated by F_2 folds preserved in high-pressure garnets belonging to the M1 mineral paragenesis. The continuation of this stage of deformation under low-pressure conditions is indicated by crystallization of minerals belonging to the low-pressure M_2 paragenesis parallel to the axial planed of the F_2 folds. The documented quartz aggregates indicate that folding and compression of the PKZ during the D_2 deformation stage was probably related to their simultaneous extension in the N-S direction, i.e. parallel to the boundary of the colliding terranes and therefore parallel to the orogen extension. Slight increase of temperature in the PKZ during the M_2 stage of metamorphism was probably related to the small granitoid lenses, which intruded rocks in this part of the Fore-Sudetic Block at about 335-340 Ma. Heating of the PKZ rock complexes and intrusion of granitoid melt parallel to the S_2 surfaces led to mechanical destabilization of the uplifted rock sequence and formation of local non-coaxial shear zones with top-to-SW kinematics during the deformation stage D_3. This was the last phase of exhumation of the PKZ.

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