

ing of the crustal rocks and with following hydrothermal processes.

The granites which were found in deeper parts of the Rožná mine, together with the metasomatic type of mineralisation, are objects of this study.

### Granites

The granites are light coloured, fine to medium grained rocks. The contact to surrounding gneisses is often transitional. A several meter thick zone of migmatites is developed on the contact between both rocks. However, some contacts between the gneiss and the granite are sharp and discordant. A mineral composition of the granite is very simple - plagioclase, K-feldspar, quartz, garnet and very rare biotite. Plagioclase is zoned if observed using cathodoluminescence microscopy. The grain cores exhibit a yellow luminescence, the rims are bright blue. K-feldspar exhibits even oscillatory zoning in dark blue colours. Quartz is not luminescent. Described styles of zoning constitute a magmatic fabric.

Feldspars from the surrounding gneisses are, on the other hand, mostly homogenous and unzoned. The zoning of both feldspars, together with observed discordant contacts, show that the granites are actually magmatic rocks, crystallising from a magma.

### Metasomatites

Metasomatites are in fact strongly altered - albitised - red coloured gneiss. Feldspars from this rock types are mostly very weakly luminescent. The reason for this feature is a high content of very fine dispersed hematite which quenches the luminescence, together with a strong sericitisation of the plagioclase. Irregular grains of carbonate are an important component of the metasomatites. Carbonate appears in several generations. The older one exhibit a dull, dark red luminescence. The younger generations are marked by a bright yellow to orange luminescence. The study of relations between the carbonates and other mineral phases shows that the carbonatisation was the latest alteration. The rocks were affected, just before the carbonatisation, by sericitisation together with albitisation and hematitisation. The estimated sequence of alteration shows that the rock was affected by at least two different fluid generations. The first alteration - sericitisation - was caused by hydrous fluids. The CO<sub>2</sub> rich fluids are responsible for the second one.

The anatectic granites may represent a potential source of the fluids. When compared to the gneisses, the granites are extremely depleted in water. The water content in the gneiss's fluctuate between 3.9 and 1 %. The granites contain max. 0.6 % of water. The fluids release during melting of deeper parts of the crust caused probably alterations in the hangingwall.

## Ar-Ar Thermochronology in Transpressive Zones: from Numerical Modelling towards Natural Examples

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Ar-Ar hornblende thermochronology shows that two NE-SW trending belts with contrasting structural pattern in the Variscan basement of the Western Carpathians present also contrasting cooling ages: 1) mica schists domains presenting Variscan prograde Barrovian assemblages are strongly retrogressed along narrow steep transpressive greenschist facies zones. These zones of intense deformation exhibit exclusively Cretaceous cooling ages (ca. 80 to 90 Ma). They are surrounded by 2) regions composed of high grade gneisses and migmatites with flat, mainly extensional fabrics and Lower Carboniferous cooling ages (ca. 360 to 340 Ma). Occasionally, lozenge-shaped domains of retrogressed gneisses are present in steep shear zones, which exhibit stepped Ar-Ar spectra yielding mixed ages (from ca. 90 to 170 Ma).

Regions with Variscan plateau cooling ages are interpreted as domains exhumed from mid-crustal ( $T > 500^{\circ}\text{C}$ ) to upper crustal levels during the Variscan orogeny. In contrast, the domains with Alpine hornblende and muscovite plateau ages followed the same trajectory during the Alpine Cretaceous convergence. Using the numerical model of Lister (1996, Mac Argon program package) the domains with stepped spectra are interpreted as regions which were located in levels close to the 500°C isotherm for periods longer than 150 Ma. This lateral pattern of cooling ages can be viewed in terms of differential vertical tectonic exhumation of the thermally zoned pre-Mesozoic basement.

This thermochronological and structural pattern is interpreted as a result of the Alpine transpressive tectonics affecting the continental crust with a thermal profile stabilised from the end of the Variscan orogeny to the Cretaceous times. This continental crust had a layered structure with high-grade gneisses in the hanging wall and mica schist in the foot wall that originated during the Variscan thrusting. The Alpine convergence developed steep transpressive zones with strongly partitioned deformation and rheologically weakest micaschists were extruded along pure shear dominated vertical zones to supra-crustal levels.

This geological situation was modelled using 2D thermo-mechanical - rheological modelling coupled with numerical thermochronological calculations. This kinematical forward modelling allows us to quantify lateral and vertical displacements as well as the time factor necessary for interpretation of geochronological studies of successive metamorphic episodes.

### References

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