sufficient supply of alkalies through dedolomitisation which is conditioned by presence of sulphates. Two possible sources are proposed: 1) brines derived from the Permian evaporites, 2) input of the sea water.

All the above described features and processes suggest the principal role of fluid flow in a course of the rauhwacke formation, which confirms the fluid inclusion study. In euhedral quartz, primary $CO_2$ rich inclusions were found with salinities over 40% and homogenisation temperatures in the range 380 - 420°C. Calculated pressures exceed 2 kbar which oversteps the proposed lithostatic pressure by 1 kbar. This excess is due to the extreme fluid pressure which, at these values, could have supported the weight of the nappe in the course of thrusting. This possibly indicates a way a displacement of many km without any strong deformation of the nappe body occurred.

# Petrography of the Zábřeh Crystalline Unit: A Review

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The Zábřeh crystalline unit (ZCU) is a metamorphosed volcano-sedimentary complex situated in the NE margin of the Bohemian Massif. A supposed gradual increase in metamorphic grade from the south to the north in the ZCU was not fully confirmed by recent data. It is possible to distinguish some relatively independent parts of the ZCU from the viewpoint of lithology and character of the metamorphism.

The southern part is formed by phyllites containing abundant intercalations of amphibolites in places with ultramafic rocks. Layers of acid metavolcanites and metadiorites are rare. The amphibolites metamorphosed under conditions of granulite facies (Babůrek and Hanžl 1997) are exposed together with garnet phyllonites in low-grade rocks (metapelites and metagreywackes) in the southernmost part of the ZCU near Pěčíkov. Amphibolites are accompanied by thin layers of strongly mylonitised marbles.

The northern part is composed of quartzite gneisses containing layers of quartzite and metarhyolite, biotite gneisses with garnet and sillimanite, augen gneisses and migmatites with intercalations of amphibolites.

Concordant bodies of tonalites are common mostly in the north part of the ZCU.

Two main described parts are separated along the Moravská Sázava river valley by a narrow, relatively independent, belt of flysch like metasediments with porphyroblasts of biotite. The belt contains a horizon of schists with staurolite north of Hoštejn village which indicates metamorphic conditions of lower amphibolite facies.

New mineral assemblages in gneisses, tonalites (chlorite) and amphibolites (chlorite, epidote) accompanied by brittle - ductile deformation are products of destabilisation during the retrograde metamorphism in the greenschist facies conditions. Indicators of the retrograde metamorphism have not been observed in metasediments from the southern part of the ZCU.

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# The Omphacite Exsolutions in Pigeonitic Pyroxene Coexisting with Na-amphibole in Meladiorite Body at Krásná Lípa (Northern Part of Bohemian Massif)

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A sample of pyroxene-amphibole meladiorite with unusual pyroxene exsolution textures and Na-amphibole was collected in a core of the drillhole situated 0.5 km to the north of Krásná Lípa (southern part of the Šluknov area). The recognisable omphacite lamellae in host pigeonite as well as small nyböite and cummingtonite crystals were used to constrain a history of cooling from igneous conditions as well as regional metamorphism ones. The jadeite-rich clinopyroxene and alkali amphibole are characteristic of high-grade metamorphic rocks (blueschists and eclogites) whereas they would be absent in meladiorite. This finding suggests that elastic strain energy may have been affected by metamorphism during deep meladiorite emplacement. The list of Na-amphibole occurrences within basic dykes involves the bluish riebeckite overgrowths on brown amphibole in "lamprophyre" dyke from environs of Dresden by Tröger (1932) and numerous occurrences of the Na-Ca amphiboles (taramite, katoforite) in "lamprophyres" within the Lusatian granitoid pluton by Beger (1913). All places of occurrence correspond to a positive gravity anomaly beneath the Lusatian area (Lindner 1972).

| Mineral SO-V-9/15.6 m | nyböite omphacite exolutions | | Al-ferro--augite | Al-pigeonite relics | | plagioclase corerims | | ferro-actinolite | cumming--tonite |
|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | 49.34 | 48.24 | 53.51 | 53.49 | 52.75 | 57.50 | 60.67 | 51.70 | 46.52 |
| $TiO_2$ | - | - | 0.15 | 0.30 | - | - | - | 0.15 | - |
| $Al_2O_3$ | 21.26 | 18.47 | 6.52 | 1.91 | 28.52 | 23.70 | 20.14 | 6.30 | 17.82 |
| $Cr_2O_3$ | - | - | - | 0.04 | - | - | - | - | - |
| $Fe_2O_3$ | 7.68 | - | - | - | - | - | - | - | - |
| FeO | 3.84 | 19.50 | 22.66 | 16.18 | 0.62 | - | 3.09 | 21.90 | 18.81 |
| MnO | - | - | 0.39 | 0.38 | - | - | - | 0.38 | - |
| MgO | 4.02 | 9.15 | 10.39 | 25.60 | - | - | 1.35 | 10.04 | 8.83 |
| CaO | 4.25 | 0.68 | 4.75 | 2.01 | 10.12 | 6.48 | 0.58 | 4.59 | 0.66 |
| $Na_2O$ | 7.28 | 3.87 | 1.06 | - | 6.94 | 11.69 | 13.74 | 1.03 | 3.74 |
| $K_2O$ | 0.15 | 0.05 | 0.55 | - | 0.39 | - | - | 0.53 | 0.05 |
| $(H_2O^+)$ | 1.88 | - | - | - | - | - | - | - | - |
| | 99.70 | 99.96 | 99.98 | 99.91 | 99.34 | 99.37 | 99.67 | 96.62 | 96.43 |

**Tab. 1.** *Representative microprobe analyses of selected minerals of the meladiorite*

## Petrographic varieties of gabbroic and meladioritic rocks

Satellite bodies of gabbronorites, gabbros, meladiorite, and gabbro porphyrites intruded the pre-Variscan Lusatian granodiorite that extends locally into the Nisa orthogneiss. They have been formerly assigned as "proterobase", diabase, dolerite or lamprophyre (Beger 1913, Kramer 1976), but Kramer and Peschel (1987) and Kramer (1988) concluded that they had a plutonic character and gabbronoritic or dioritic petrochemical trends. Beside them, spessartites, granodiorite and ferrodiorite porhyrities constitute late-Variscan dyke rock association penetrating the Lusatian granodiorite. The described coarse-grained meladiorite from Krásná Lípa exhibits poorly preserved subophitic texture and primary zoned andesine to labradorite has both broken tabular and lath habitus. Plagioclase is altered to albite associated with saussuritised and prehnitised cores. The Al-pigeonite and ferroaugite relics showing slight pleochroism are replaced by green ferroactinolite rims associated with magnetite and pyrhotite disseminations. A set of omphacite and ferroaugite lamellae under high-temperature inverted pigeonite are petrologically significant: they allow to "see through" the pyroxene exsolution textures and the effect of regional metamorphism below the stability of pigeonite. Omphacite contains 28.2 % of the jadeite member. Decomposition of lamellae produces the nyböite needle crystals - $Na_3Mg_3Al_3(Si_7Al)O_{22}(OH)_2$. Mineral chemistry is seen in Table 1. In post-deformational regime, the cummingtonite epitaxial intergrowths and biotite flakes were formed. Subordinate skeletal ilmenite with magnetite lamellae is transformed to sphene. In accordance with a modal analysis it can be stated that prevailing mafic minerals are especially those of ferroaugite and ferroactinolite, while Al-pigeonite, omphacite, cummingtonite, nyböite and chloritised biotite belong among accessory constituents. Whole-rock chemical composition (in wt%) is seen as follows: $SiO_2$=49.51 %, $TiO_2$=1.42 %, $Al_2O_3$= =15.75 %, $Fe_2O_3$=5.53 %, FeO=8.09 %, MnO=0.15 %, MgO= =5.32 %, CaO=8.45 %, $Na_2O$=3.08 %, $K_2O$=1.01 %, $P_2O_5$= =0.04 %, $H_2O$=1.61 %, $CO_2$=0.08 %, F=0.09 %, Cl=0.02 %, S=0.28 %, $H_2O^-$=0.05 %.

## Timing of meladiorite emplacement

According to Kramer (1988), diverse group of gabbros and meladiorites intruded before the Upper Carboniferous granite stock at Stolpen and the only potassium/argon dating on biotite concentrate showed < 400 Ma age (Upper Devonian).

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