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THERMAL EFFECTS OF THE ŽULOVÁ GRANITE PLUTON, SILESICUM, EASTERN VARISCAN FRONT

INTRODUCTION

The eastern mantle of the Variscan Žulová Pluton (ZP), is formed by a volcano-sedimentary complex, with characteristic periplutonic HT/LP-MP metamorphism continuously decreasing toward the east (Souček 1987). The zone of contact migmatization (Bt + Grt + Sil + Crd + Kf) is 0.5-1 km wide but the periplutonic aureole (Bt + Grt + Sil + St+Ms) is several times wider. The contact in the N and NW is obscured due to extensive Quaternary cover and in the SW it is in tectonic contact with Keprník, Branná, and Staré Město Units along the Marginal Sudetic Fault (Fig.1).

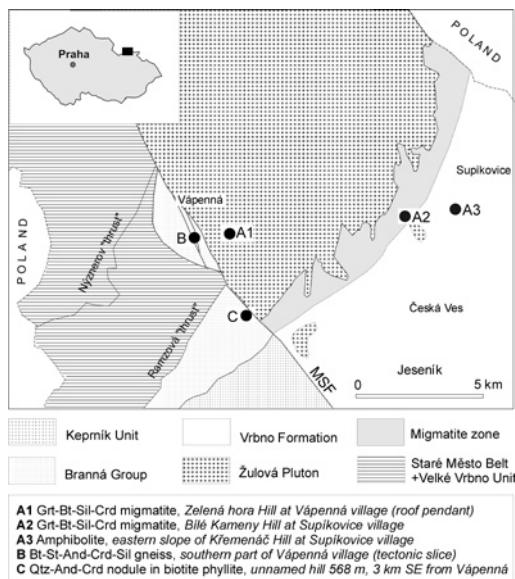


Fig. 1. Simplified geological map of the area studied.

The samples studied were collected during regional geological mapping at the scale 1: 25 000 (sheets 14-223 Lipová Lázně, 14-224 Jeseník). Besides “normal” rocks characteristic for the ZP mantle (type “A”), a peculiar gneiss, not reported till now from the Žulová Pluton Mantle, is described (type “B”). Biotite phyllite with quartz – andalusite – cordierite nodules (type “C”) was found in the Branná Group close to the Marginal Sudetic Fault (MSF). All these three different rock types are interpreted as periplutonic metamorphites related to the ZP.

PETROLOGY AND THERMOBAROMETRY

TYPE “A” rocks (A1-A2) represent migmatites from migmatite zone of ZP. The mineral assemblage comprise quartz + plagioclase + potassium feldspar + biotite +

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garnet + sillimanite + cordierite. Scarce muscovite and chlorite represent retrograde phases, ilmenite, graphite, zircon, rutile, titanite, apatite and monazite are accessory (Rozkošný - Souček 1989, Cháb - Žáček 1994). Staurolite, kyanite and andalusite are mostly absent and occur very rarely as tiny relics (kyanite and staurolite) or as components in pegmatitic metatect (andalusite). Garnet is Ca-poor almandine showing a weak progressive zoning and retrograde rims up to several hundreds of microns wide, and a compositional variability:

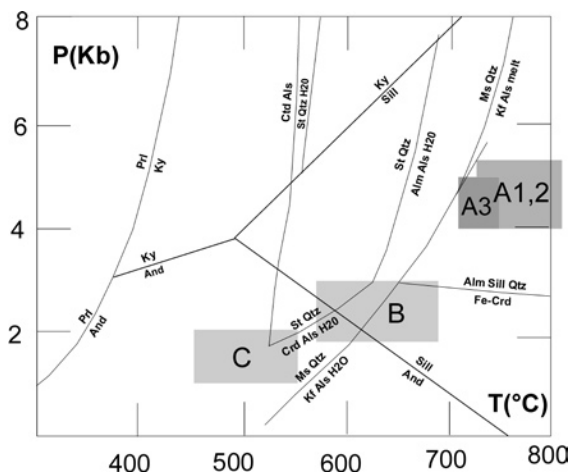
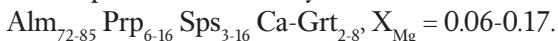


Fig. 2. P-T diagram for rocks affected by Žulová Pluton contact/periplutonic metamorphism.

Temperatures calculated for rocks from migmatite zone (samples A1, A2) show a wide range of values (720-947 °C) but the temperatures ranging between 720 and 800 °C are most frequent (at 4-5 kbar).

Sample A3 is amphibolite occurring outside of migmatite zone. The temperatures calculated are slightly lower, mostly

711-744 °C, at 4-5 kbar, (compare Souček 1987, Losos - Hladíková 1988).

TYPE "B" represents a relict of former metamorphic mantle of ZP preserved as a tectonic slice between two branches of MSF. The rock (biotite – staurolite – andalusite gneiss) has a mineral assemblage unusual for the area of ZP mantle. It is composed of prevailing quartz + oligoclase (18-32 An) + biotite ($X_{\text{Mg}} = 0.37-0.39$) + muscovite + staurolite ($X_{\text{Mg}} = 0.12-0.18$) + andalusite, minor cordierite ($X_{\text{Mg}} = 0.55-0.61$), rare garnet ($\text{Alm}_{70-74} \text{Prp}_{9-11} \text{Sps}_{12-16} \text{Ca-Grt}_{3-6}$, $X_{\text{Mg}} = 0.11-0.13$) and sillimanite. Zn-rich spinel, ilmenite, apatite and tourmaline are accessory. The rocks (2 samples studied) contain early staurolite overgrown by andalusite, all these minerals are replaced by cordierite followed by growth of young muscovite + sillimanite, and Zn-rich spinel. The development of mineral assemblage shows a typical low - pressure contact metamorphic P-T path (Spear 1993). The P-T conditions calculated and inferred using P-T grids of Spear and Cheney (1989) range between 568-690 °C at 2-3 kbar (Fig 2).

TYPE "C" is biotite phyllite enclosing large quartz – andalusite – cordierite - apatite nodule. The rock was sampled at western slope of unnamed hill (568 m) about 3 km SE of Vápenná village, 400 m SW of the MSF. Cordierite crystals (1-2 cm long) are completely replaced by chlorite from chamosite group (detected by XRD) but the hexagonal prismatic shape of pseudomorphs indicates the nature of the primary min-

eral quite well. The assemblage andalusite + cordierite gives evidence for LP contact metamorphism of the Branná Group at least in the area close to the MSF. Approximate P-T conditions inferred from P-T grid correspond to 450-550 °C at pressures lower than 2 kbar (Table 1).

Table 1. P-T conditions of various rocks affected by Žulová Pluton contact / periplutonic metamorphosis.

Sample	Rock	Method	Author	T (°C)	P (Kb)	Reference
	migmatite, gneiss	garnet-biotite	Ferry - Spear (1978)	650-680	5	Souček (1987)
	calc-silicate rock (erlan)	carbon isotopes		560-730	3-5	Losos et al. (1988)
A1	Bt-Grt-Sil-Grd migmatite	garnet-biotite	several calibrations	720-925	(4-5)	this paper
A2	Bt-Grt-Sil-Grd migmatite	garnet-biotite	several calibrations	773-947	(4-5)	this paper
A3	amphibolite	edenite tremolite	Holland - Blundy (1994)	711-717	(4-5)	this paper
A3	amphibolite	edenite - richterite	Holland - Blundy (1994)	719-744	(4-5)	this paper
B	Bt-St-And gneiss	garnet-biotite, PT-grid	several calibrations	568-690	<3	this paper
C	Bt-And-Crd in phyllite	PT-grid	Spear - Cheney (1989)	450-550	<2	this paper

CONSLUSIONS

Samples from three tectonic levels of sedimentary rocks affected by contact/periplutonic metamorphism of the Žulová Pluton are described (See Figs. 1,2, Table 1).

1) HT/LP-MP “normal” metasediments and metavolcanics of the ZP mantle. The P-T conditions estimated correspond to 720-800 °C in migmatite zone, and 650-744 °C outside migmatite zone, about 2 km of the contact (all at pressures 4-5 kbar).

2) HT/LP “exotic” gneiss preserved tectonically at the MSF. The gneiss containing an “unusual” assemblage: Qtz + Plg + Bt + Ms + St + And + Crd + Grt + Sil + Sp + Ilm, yielded P-T conditions 568-690 °C and 2-3 kbar. Larger-scale geological situation clearly shows that the rock is a small tectonic relict preserved among the two branches of the MSF. The mineral assemblages and P-T conditions calculated indicate that the rock represents an upper part of contact aureole of the ZP which was in other places completely removed by erosion.

3) LT/LP metasediments of the Branná Group close to MSF. The presence of andalusite + cordierite in low-grade rocks of the Branná group provides evidence that these rocks were also affected by ZP intrusion at least in the vicinity of the MSF.

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