THE DARK ENCLAVES IN TURČOK A-TYPE GRANITE

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Abstract: The dark enclaves enclosed in metamorphosed A-type hypersolvus Turčok granite were studied. They are interpreted as chilled margins, which better represent primary magmatic composition. Composition of minerals in enclaves are similar than in granite. Primary magma and alkali- feldspars were richer in K-component. Geochemistry shows that enclaves are richer in, Ba, Li, Rb and Cs comparing to surrounding granite. K-rich composition of primary magma is in agreement with other post-orogenic (Permian) granitoids of Western Carpathians.

Key words: Western Carpathian**,** granite, Turčok, A-type, hypersolvus, enclave

Introduction

In most foregoing works about Turčok granite, there was noticed intensive mylonitisation, which destroyed primary nature of magmatic structures and textures. The dark enclaves in the central part of the granite body were discovered during detailed field work. Kamenický-Kamenický (1955) consider them as relics of sedimentary envelope. Relatively well preserved primary magmatic fabrics are present too. The most of analytical results of the bulk rock analysis show, that Turčok granite represents relatively SiO_2 rich, biotite granite type with strong prevailing of Na over K (e.g. Varga,1975) with increased Fe content. Based on the geochemistry and mineralogy a granite Uher-Gregor (1992) stated A-type affinity of the Tučok granite and supposed its Permian-Triassic age. On the basis of the Zr saturation index Uher-Broska (1997) established the temperature of zircon crystallisation on 860 – 940 °C.

Enclaves of the granite.

Investigated types of granitoid and its enclaves introduce most mafic types of Turčok granite, which make possible primary nature of the initial magma better appreciate. The dark enclaves enclosed in a granite represent 5-15 cm large, sub-angular shaped (Fig. 1) enclaves and have granodiorite composition. They are microgranular, with anhedral alkali feldspars of K-Na composition (primary mostly sodium high sanidine to potassium high albite).

Composition of primary alkali feldspars is in average approx. 40 % of Or and 60% of Ab (in the granite approx. 23% Or and 77% Ab) component (Fig. 2). The breakdown of primary alkali feldspars into albite and orthoclase end-members due to postmagmatic decomposition or Alpine metamorphism is present (Fig. 3). The relationship of enclaves to granite is stressed by presence of Fe rich biotite (F/FM=90-94,7), similarly biotite in granite is rich on Fe (F/FM~94). Both contain high content of Zr, Hf, Y, Yb (Tab. 1). Sometimes microgranular matrix encloses larger minerals which crystallised earlier in granite magma (Fig. 4). The presence of needles of apatite crystals in the quartz is typical for enclaves, which indicate rapid crystallisation (Fig.5).

Geochemistry proves, that enclaves comparing to surrounding metasediments (Gelnica and Ochtiná groups) are different in their composition and comparing to granite they have similar chemical features (Fig.6).

Similar composition of microgranular enclaves (Fig. 6) and enclosing granite point to genetic link between the granite and the enclave. Texture of enclaves indicates rapid crystallisation of the granodiorite – K-rich magma (which is typical for the post-orogenic Permian granitic rocks - Uher-Broska, 1996), with K_2O > 4,0 wt.%. Enclaves represent composition close to primary magma during first stages of intrusion into high crustal level. Together with the shape of enclaves, this indicates, that they rather represent disintegrated blocs of marginal, rapidly solidified granodiorite composition later invaded by granite magma.

Thus, due to fractionation of K-richer alkali feldspar composition, magma of Turčok granite rapidly changed during crystallisation (Fig.7) and later probably by interaction with low metamorphosed metasediments.

Primary more K-rich magma of Turčok granite is predictable from the study of enclaves (disintegrated frozen marginal part of granite body), which is in correspondence with other A-type magma in Western Carpathians (Uher-Broska, 1996). Geochemistry shows, that this type belongs to the types derived from the continental crust (Fig. 8), which needs the external source of heat.

Summary

Study of dark microgranular enclaves is contribution to the petrogenesis of Turčok granite. Revealed enclaves do not represent block of country rocks as was supposed earlier (Kamenický-Kamenický,1955). They are hypersolvus mikro-granodiorite, with similar

geochemical and mineralogical composition compared to surrounding granite, but it represents more mafic portion, enriched in K_2O, Ba, Li, Rb, Cs. Enclaves are evidence for more mafic, K_2O rich primary nature of the magma of Turčok granite. This fact is in accordance with more K_2O rich post-orogenic granite magmas typical for the Permian of the Western Carpathians (Broska-Uher, 1996).

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Table 1.

Fig. 1

Tab.1

Sample Type	**9039/2E enclave**	**9039/2 granite**
SiO_2	66.83	69.77
TiO_2	0.41	0.38
Al_2O_3	13.68	14.05
Fe_2O_3	2.50	2.21
FeO	5.67	2.06
MgO	0.47	0.90
CaO	0.98	1.53
MnO	0.2	0.067
Na_2O	3.89	5.82
K_2O	4.03	2.04
H_2O^+	0.45	0.03
H_2O^-	0.14	0.02
SO_3	0.01	0.06
CO_2	< 0,4	0.2
P_2O_5		0.11
F	< 0,05	0.015
Cl	0.02	0.01

Sample Type	**9039/2E enclave**	**9039/2 granite**
	ppm	
Ba	1 044	782
Be	3.3	3.9
Ce	119	200.3
Co	< 1	1
Cr	13	40
Cs		3.5
Cs	14	
Cu	7	9
Eu	2.2	4.8
Ga		30
Gd	15.3	
Hf	10.8	25.9
La		110.3
La	56	73
Li	21	5
Lu	1.28	1.67
Mo	0.4	5
Nb	21	40
Nd	72	106
Ni	9	5
Pb	13	6
Rb	135	40
Sc	9	13.2
Sm	16	20
Sn	10	9
Sr	133	160
Ta	1	2
Tb	2.2	2.3
Th	10	15.2
U		<0,9
V	14	5
Y	74	69
Yb	9.4	10.1
Zn	334	146
Zr		650
Zr	361	845

Elements marked with bold - analysed by INAA method

Fig. 1.

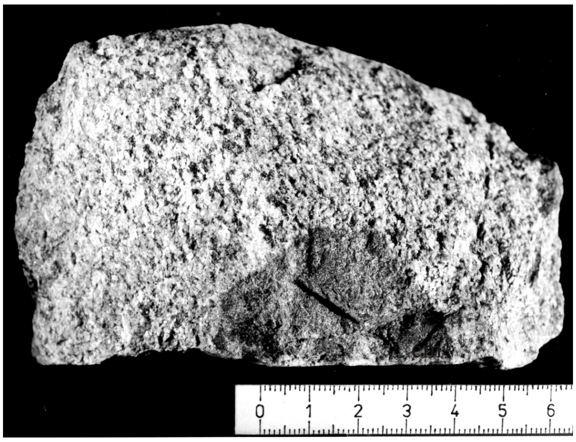

Fig. 2.

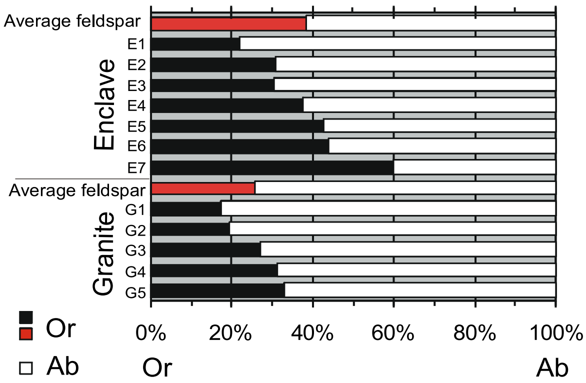

Fig. 3.

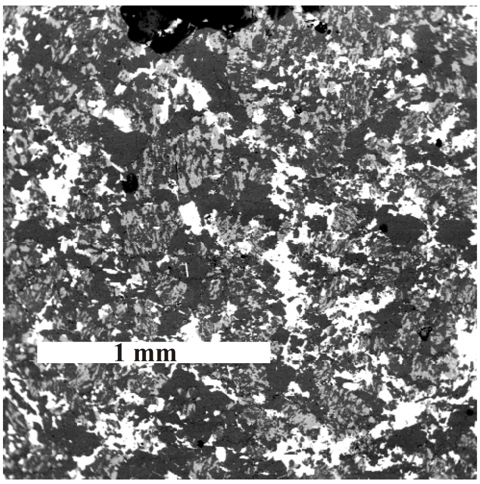

Fig. 4.

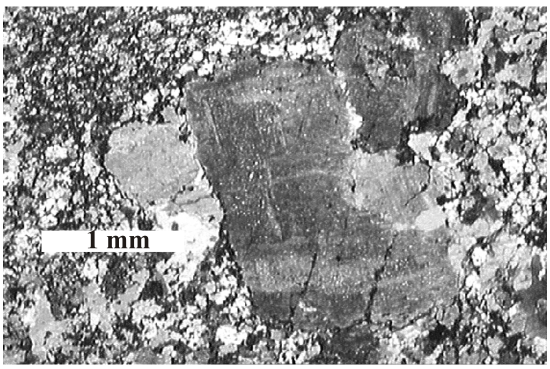

Fig. 5.

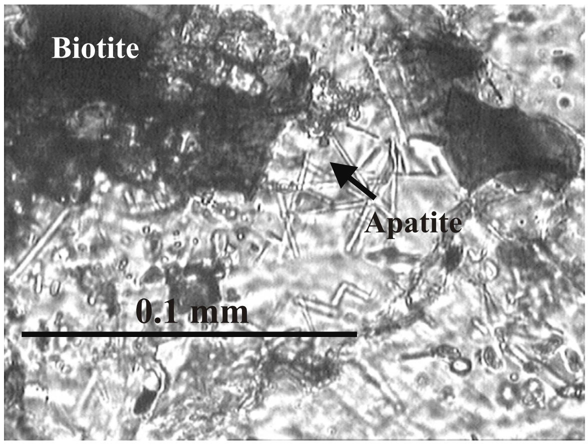

Fig. 6.

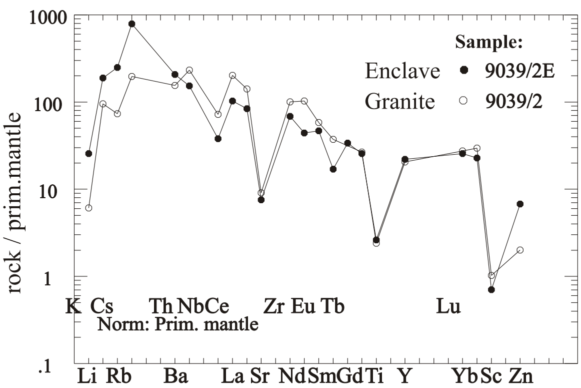

Fig. 7.

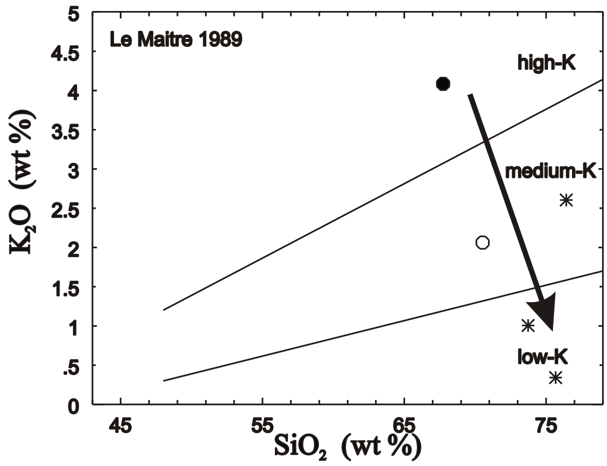

Fig. 8.