PETROLOGY AND ORIGIN OF THE RED GRANITE PEBBLES FROM THE MORAVIAN KARST OF THE BRNO MASSIF, CZECH REPUBLIC

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The Moravian Karst is built up by a thick Middle Devonian to Lower Carboniferous limestone sequence with a probably Lower Devonian to Givetian horizon of clastic sediments at the base. Preferentially in the southern part of the Moravian Karst, this clastic horizon includes polymict conglomerates with abundant pebbles of distinct red granites (ŠTELCL & CHROMÝ, 1962; ŠTELCL, 1969).

The granite pebbles are mostly felsic, medium-grained rocks, with a modal composition of circa 25–35% K-feldspar (perthitic), 25–35% sodic plagioclase (mostly albite), 30–40% quartz, and between 3–8% mica (dominantly muscovite). A fairly important mafic mineral in the rocks is secondary haematite (up to 1 vol-%), which apparently formed from the breakdown of biotite and possibly magnetite. Quite often, biotite has completely disappeared. A further secondary Fe-phase is limonite. Zircon, apatite, monazite and xenotime were recognized as accessory magmatic minerals.

In handspecimen, the micas (mostly muscovite, but sometimes also biotite) often appear in a pegmatoid fashion, i.e. as isolated nests composed of big mica sheets up to half a centimetre. Fluorine contents in such muscovites turned out to be high, in a range of circa 1 wt-%, indicating growth in a highly differentiated residual melt.

A chemical analysis of a typical sample from 1 km SE of Bilovice nad Svitavou is given in Tab.1. The major element composition of this medium-grained, red, biotite-free muscovite-granite is peraluminous (A/CNK = 1.27). Low Sr, Zr and REE abundances together with a pronounced negative Eu anomaly are suggestive of a highly evolved, low-T magma. Nb and Ta contents are significantly elevated, probably as a result of passive enrichment during fractional crystallization.

U, Th and Pb contents in the accessory monazites were measured by electron microprobe analysis and used to constrain the formation age of the rock (for the method see MONTEL et al., 1995; FINGER et al., 1996). A weighted average of 24 analysis points in three monazite grains yielded a model age of 577±25 Ma, which corresponds perfectly to the intrusion ages of the Brno batholith granitoids (VAN BREEMEN et al., 1983; FINGER et al., 1996).

Considering this dating result, and their petrographic and geochemical features, the red granite pebbles of the Moravian Karst may be best interpreted as remnants of the former, widely fractionated roof facies of the Brno batholith. It seems very plausible that

these upper levels of the Brno batholith were extensively eroded and reworked to clastic sediments during the Early Palaeozoic.

However, the peraluminous, superficial S-type nature of many of the granite pebbles should not be taken as argument for the involvement of a S-type source in formation of the Brno batholith. The trace element systematics suggests rather that these rocks are strongly differentiated end members of the high-K I-type granite suite, which builds up the western half of the Brno batholith, west of the so-called basic zone (see FINGER et al., 1995).
The strongly negative εNd initial ratio, that has been determined for sample Fi-14/95 (Tab.1), argues against a derivation from the juvenile, isotopically primitive eastern domain of the Brno batholith within which the pebbles are now deposited.

	wt. %		ppm		ppm
SiO_2	74.41	Cr	8	U	2.96*
TiO_2	0.03	Sc	6	La	8.87*
Al_2O_3	14.90	Rb	217	Ce	17.36*
$Fe_2O_3^{tot}$	1.23	Cs	1.45*	Nd	8.61*
MnO	0.02	Ba	231	Sm	1.69*
MgO	0.08	Sr	24	Eu	0.36*
CaO	0.39	Ta	4.08*	Gd	4.62*
Na_2O	3.89	Nb	44	Tb	0.95*
K_2O	4.28	Hf	1.58*	Yb	0.58*
P_2O5	0.05	Zr	34	Lu	0.07*
H_2O	n.d.	Th	9.24*		
total	99.28		eNd(t = 580)		-5.0

Tab. 1: Chemical analysis of sample Fi-14/95.
**determined by INAA, the other elements by conventional XRF technique.*

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