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ARE THE GRACZE BASALTOIDS (OPOLE SILESIA) DEVOID OF THE UPPER MANTLE ULTRAMAFIC ENCLAVES?

Basaltoids of Gracze near Niemodlin and of St Anna Mountain in the Opole part of Lower Silesia belong to the eastern termination of Central European Volcanic Province (CEVP) characterized by considerable deficiency of silica. Moreover, the Lower Silesian basaltoids display the most depleted character within the whole CEVP (Blusztajn, Hart 1989). The Gracze basanitic lava extruded on Late Oligocene (25 ± 3Ma) along SW-NE trending faults transversal to the Odra Fault, whereas the St Anna nephelinitic lavas extruded during two episodes: first, on Late Oligocene (26.5 ± 3Ma), along the NW-SE trending faults related to Odra Line; second, on Early Miocene (21 ± 3Ma), along the faults transversal to the Odra Fault (Birkenmajer *et al.* 1973, 1977).

Table 1. Representative microprobe analyses of olivines and clinopyroxenes of the Gracze basanite and of ultramafic xenolith from St Anna Mt. nephelinite.

	Olivines				Clinopyroxenes				
	Gracze			St Anna	Gracze				St Anna
	phenocrysts		from enclaves		phenocrysts			from enclaves	
	1	2	3	4	5	6	7	8	9
SiO_2	39.13	40.27	40.94	40.94	46.30	52.12	54.02	51.28	53.31
TiO_2	0.20	0.06	0.11	0.04	3.45	1.51	0.41	0.54	0.27
Al_2O_3	0.00	0.07	0.00	0.00	7.35	2.32	0.35	4.39	1.61
Cr_2O_3					0.08	0.10	0.01	1.54	1.46
FeO	21.43	11.68	10.14	9.06	6.74	5.26	5.74	3.35	2.44
MnO	0.54	0.28	0.11	0.09	0.10	0.20	0.10	0.18	0.10
NiO	0.08	0.48	0.56	0.38	0.00	0.00	0.00	0.02	0.16
MgO	39.32	45.88	47.04	48.73	12.22	14.64	15.18	14.85	16.20
CaO	0.62	0.04	0.03	0.00	23.41	23.51	23.51	22.79	22.98
Na_2O	0.00	0.45	0.58	0.00	0.34	0.54	0.00	0.80	0.67
K_2O	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.01	0.06
Total	101.32	99.21	99.51	99.26	99.99	100.23	99.32	99.75	99.26
Fo	76.6	87.5	89.2	90.6					
Wo					51.2	49.0	47.9	49.5	48.5
En					37.3	42.4	43.0	44.8	47.5
Fs					11.5	8.6	9.1	5.7	4.0

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Apart from petrography and geochemistry, the mineral chemistry of basanites from the main quarry of Gracze and – for comparison – of nephelinites from the St Anna Mountain was studied in details. Megascopically, the basaltoids from the above mentioned localities differ in content of the upper mantle ultramafic enclaves. The St Anna Mt. nephelinites contain abundant, but relatively small lherzolitic and harzburgitic enclaves, while the Gracze basanites look like if they were completely devoid of such peridotitic enclaves. Among phenocrysts, xenocrysts and matrix microlites of the Gracze basanite, the major silicate minerals are clinopyroxene, olivine, nepheline and feldspars, whereas titanomagnetite is the main opaque oxide mineral (Chodyniecka 1969).

In the olivine phenocrysts of the Gracze basanite, the forsterite content ranges from Fo_{77} to Fo_{88} (Table 1). The zoned olivine phenocrysts display rimward decrease of Fo. The small, latest generation olivine phenocrysts are Fo-poorest. There were also found Fo-richer olivine xenocrysts (e.g. no 3 in Table 1) or aggregates of several crystals showing irregular extinction caused by deformation lamellae (Fig. 1). The xenocrysts are similar to olivine crystals from peridotitic enclaves of the St Anna Mt. nephelinite. Most likely, the olivine xenocrysts of the Gracze basanites originated in the course of disaggregation of upper mantle peridotitic enclaves.

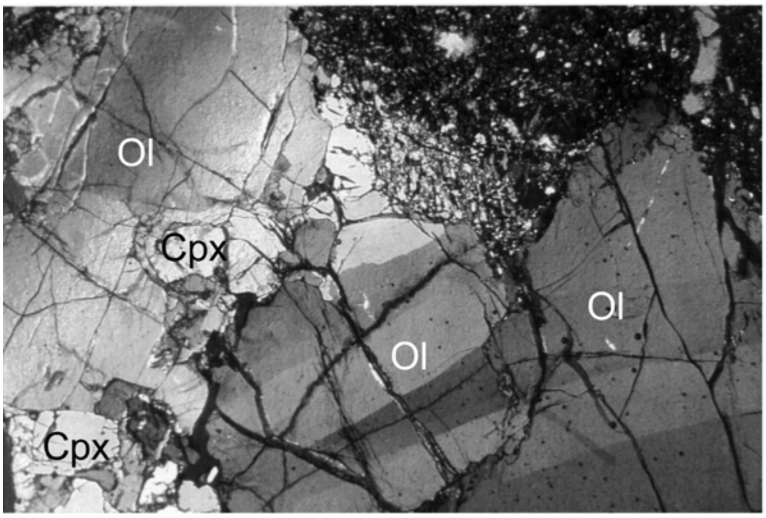

Fig.1 Corroded relict of the lherzolitic enclave from the Gracze basanite.

The clinopyroxene phenocrysts of the Gracze basanites are very diversified. All the clinopyroxenes are Ca-rich (Wo_{48-52}) and represent the diopside-hedenbergite solid solutions (Table 1). The biggest clinopyroxene phenocrysts of an earlier generation, coming, sometimes, from aggregates of euhedral crystals are relatively rich in Cr, their *cr* number (*cr* = Cr/(Cr+Al) atomic ratio) ranges from 0.10 to 0.12, while their *mg* number (*mg* = $Mg/(Mg+Fe^{2+})$ atomic ratio) is relatively high (0.86-0.90). They are also relatively rich in TiO_2 (1.0 - 2.0 wt %). The smaller, next generation phenocrysts are poorer in Cr (*cr* = 0.03-0.06) and show lower *mg* =

0.80-0.84. As to the TiO_2 content, they do not differ from the earlier generation phenocrysts. Relatively small phenocrysts of the latest generation exhibit low *mg* = 0.81-0.82 and the lowest *cr* ? 0.01. The latest generation clinopyroxenes can occur in two different variaties - either rich in alumina and richest in TiO_2 (up to 3.5 wt %) or almost aluminaless and poorest in TiO_2 (e.g. no 7 in Table 1). The last clinopyroxene variety might have been originated at the expense of quartz, as it was described in the case of the Śnieżne Kotły basaltoid contaminated by the Karkonosze granite (Bakun-Czubarow, Białowolska this volume). Apart from the phenocrysts, the clinopyroxene xenocrysts can be also found in the Gracze basanites. These xenocrysts are chromium-bearing diopsides (e.g. no 8 in Table 1) relatively poor in TiO_2 (0.3–0.6 wt %), showing high *cr* (0.2–0.4) and *mg* (0.92) numbers. They resemble clinopyroxenes of the upper mantle peridotitic enclaves abundantly occurring in the St Anna Mt. nephelinites (no 9 in Table 1).

Considerable diversity of the olivine and clinopyroxene pheno- and xenocrysts points to the complex origin and evolution of the Gracze basanite, particularly to the role of fractional crystallization, contamination with felsic rocks as well as intensive disaggregation of the upper mantle peridotitic enclaves.

The apparent lack of peridotitic enclaves in the Gracze basanites points to the differences in magma dynamics and abilities to disaggregate and assimilate the enclaves between the Gracze basanitic- and the St Anna Mt. nephelinitic magmas.

Thus the Gracze basaltoids were not originally devoid of the upper mantle peridotitic enclaves, but the enclaves were almost completely disaggregated as well as partly dissolved and assimilated in the course of magma uplift and extrusion.

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