THE SIGNIFICANCE OF TEXTURAL AND STRUCTURAL PROPERTIES OF NORTH-MORAVIAN BASALTOIDS FOR THE MANUFACTURE OF MINERAL FIBRES

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The present criteria which basaltoids for petrurgical purposes should meet are generally regarded as being associated with the qualitative and quantitative parameters of their chemical and mineralogical composition. However, in petrurgical practice one can observe the phenomenon that rocks with virtually identical compositions show variable technological properties during the melting and subsequent processing. This is also the case of alkaline olivine basalt and nepheline basanite from the Bílčice locality (12 km SE of Bruntál) used in the manufacture of rockwool. This variability of petrurgic properties, shown in spite of a relatively very stable chemical and mineralogical composition of the raw material, was the reason why the rocks were subject to a detailed petrographic and geochemical study.*

This study resulted in the finding that in assessing the raw materials for petrurgical processing according to their chemical and mineralogical composition, attention should also be paid to the textural and structural characteristics of the respective rocks.

INTRODUCTION

The basaltoid rocks of North-Moravian volcanites have so far been studied by a number of authors. As to the extent of knowledge contributed, the papers by Pacák [20] and Barth [1-3] can be especially appreciated. There is also a more recent complex study by Fediuk and Fediuková [5], and the actual aspects of basalt rockwool processing were dealt with by Kočandrle [10] and by Krutský et al. [11]. The latter studies showed that the basaltoids extracted in the Bílčice quarry are the most suitable petrurgical raw material in northern Moravia, thanks to the large amounts available, to their chemical and mineralogical composition showing low variability, and to their fine-grained and homogeneous texture. The significance of texture for petrurgical processing has been mentioned in general terms [5,14]. In spite of this, the rock being extracted exhibits such a variability of behaviour in the course of the melting process that a more detailed study of the problem was deemed necessary.

Geological characteristics

The Bílčice locality constitutes a part of the East Sudetenland neovolcanites represented by the Velký Roudný stratovolcano (figure 1). Its products cover an area of about 8 sq. km. This typical stratovolcano is composed of volcanic ejecta, pyroclastic rocks, and the following four basic lava streams (figure 1, [1,2]):

- the Mlýn Roudná stream
- the Heroldův Mlýn stream
- the Chřibský les stream
- the Černý les stream.

The rock deposit proper is situated at the centre of the Chřibský les stream and at its SE edge. The stream is about 5km in length, max. 1 km in width and up to 50 m in thickness [1]. The individual authors differ in their opinion as to the number of effusions involved in the stream; [20] assuming only one, while Barth [1], on the basis of petrographic observations, as well as Müllerová and Müller [19], according to geophysical measurements, assume the existence of two streams. None of the authors specify the thickness of the effusions.

The issue of the number of effusions composing the stream may explain the existence of two basic types of basalts constituting the lava stream, where the types have essentially the same mineralogical composition but differ in particular in their textural and structural characteristics:

1. Massive basalt with a distinct porphyritic texture, containing olivine phenocrysts up to 2 mm in size. The olivine is green to dark green in colour, which corresponds to a low conversion degree. Tabular jointing is characteristic of this type of basalt (figure 5).

* The term petrurgy and its derivations has been introduced to cover technologies based on the melting of rocks and the subsequent processing of the melts.

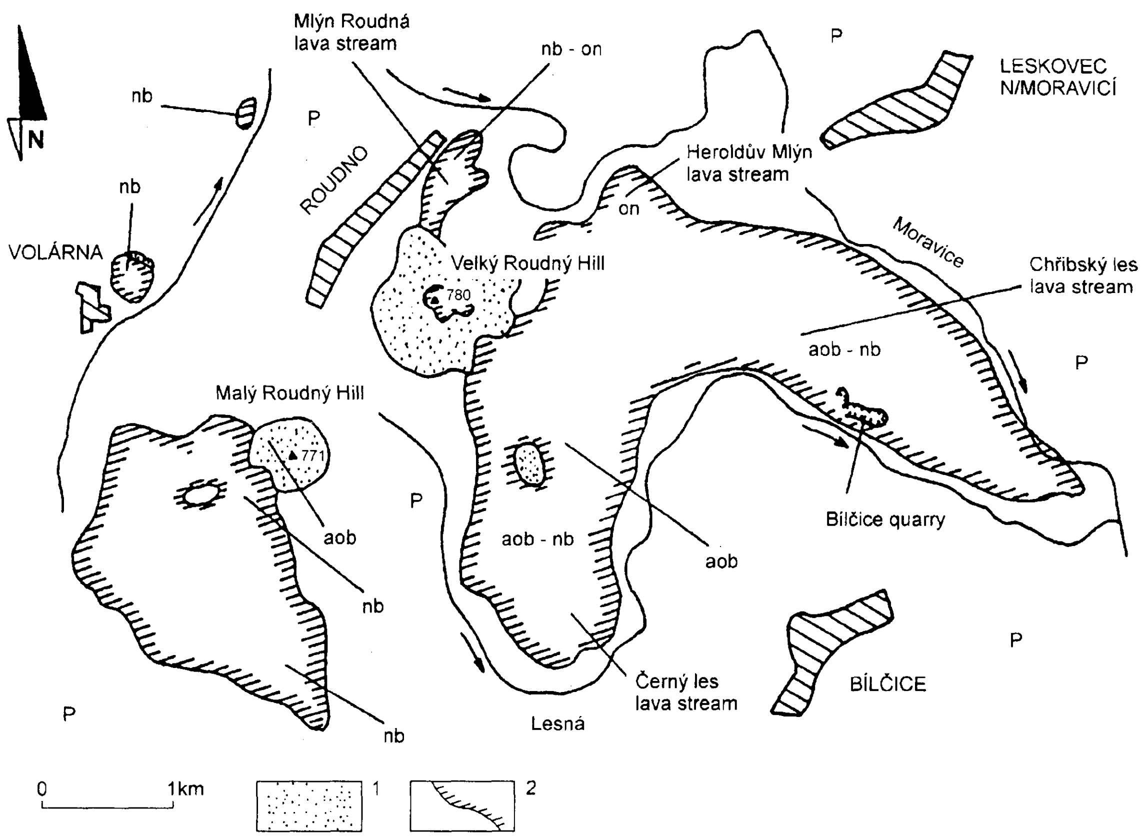

Figure 1. Scheme of occurrence of basaltoid effusion body in the neighborhood of Roudno, Leskovec n/Moravicí and Bílčice [1-3], with the use of Synoptic Geological Map of Czechoslovak Fed. Rep., 1:200 000, Sheet M-33-XXIV, Olomouc).
Explanatory notes:
1 - basaltic tuffs or loose ejectamenta
2 - boundaries of basaltoid lava bodies
aob - alkali olivine basalt
nb - nepheline basanite
on - olivine nephelinite
P - Paleozoic basement (clastic sediments of Horní Benešov and Moravice Formation of the Lower Carboniferous flysch rocks of Nízký Jeseník Mts., locally covered with Quarternary sediments

2. Basalt with a more distinct porphyritic texture where the phenocrysts are mainly olivinic of yellow-green to green-yellow colour, indicative of an olivine conversion processes. The basalt shows a typical orbicular structure with spherical disintegration. Minor amounts of vesicles are also included in the rock. The basalt shows prismatic jointing (figure 6).

Some authors explain the dissimilarity of jointing and structural and textural characteristics by the differences in the way a single lava stream was cooling down [17,20].

The appurtenance of North-Moravian neovulcanites to alkali rocks in the present sense of classification was already distinguished in the last century when Zirkel [21] described the presence of modal nepheline in basalt from Velký Roudný. However, as pointed out by Barth [1] and in the detailed petrographic studies by Pacák [20], optical identification of nepheline is often quite difficult. The latter author used the following terminology for the entire series of basaltic rocks: feldspatic (plagioclase) basalt - nepheline basanite - nepheline basalt, which in the present terminology, first introduced by Barth [1], corresponds to alkali olivine basalt - nepheline basalt - nepheline basanite - olivine nephelinite. Barth has also introduced the relationship between the petrographic characteristics and the chemical composition. His classification of the mineralogic association of North-Moravian neovolcanites has more recently been confirmed by Fediuk and Fediuková [5] who also proposed a new chemical classification using the TAS diagram after Le Maitre [15]. This classification has confirmed that the rocks of the Velký Roudný lava streams belong to a

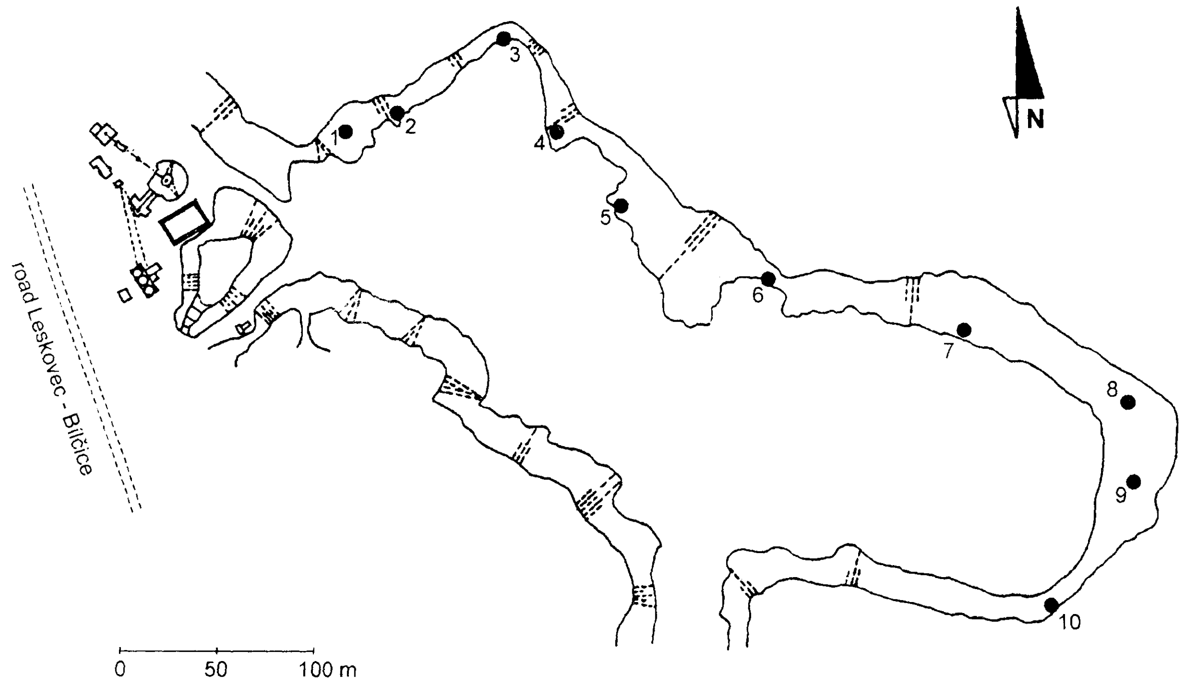

Figure 2. Map of the Bílčice quarry with marked points of sample taking (quarry topography after Marek et al. [17]).

group of rocks ranging from alkali olivine basalts to nepheline basanites. These conclusions are also in full agreement with our results (figures 3 and 4). Fediuk and Fediuková [5] analyzed 22 samples of North-Moravian neovolcanites and in the evaluation likewise used Hutchinson's classification [7] based on the C.I.P.W. standard values, according to which alkali olivine basalt is a rock with normative olivine and up to 5 wt.% of nepheline. To this definition conformed only two of the samples, one from Velký Roudný and the other from Malý Roudný. Most of the other samples were classified as nepheline basanites.

Petrographic study

The petrographic study was based on the available knowledge of the geological structure and mineralogical and geochemical composition of the Velký Roudný lava streams, and also on data relating to the entire volcanic complex of North-Moravian neovolcanites.

The petrography was studied in detail on a broken long face of the single-level quarry of WNW-ESE orientation (figure 2). Technical accessibility has restricted the area studied to a height of 15 m of the face. The basaltic rocks in the quarry exhibit typical prismatic jointing due to contraction in the course of cooling down of the Chřibský les lava stream. However, gradual transition to mural jointing can be observed at the face bottom in the western direction. From the west, where the mural jointing basalt forms almost one half of the face height, it is transgressively overlapped by the prismatic jointing one.

The prismatic jointing basalts are represented here by maculose basalt dark to light grey in colour with spherical disintegration (figure 6) (samples 1, 4, 7 - 10). The mural jointing basalt is dark grey in colour, with sharp-edged disintegration (figure 5) (samples 2, 3 and 5).

There is no sharp boundary between the positions of different jointing rocks, the transition being gradual, and the same applies to rock types with different structures (massive and orbicular). The transition is represented by sample 6. The transgressive overlapping of massive basalt towards the east can be explained by the trend and dip of the Chřibský les lava stream [20]. The lava stream extends in the NW-SE direction (figure 1) with a dip of about 20 degrees towards SE. The quarry face is oriented in the WNW-ESE direction (figure 2). The given geometry of the quarry face and the lava stream and the horizontal base of the quarry level indicates that investigation of the quarry face from the west towards the east will gradually involve the lower and higher parts of the lava stream. The facts described above were used as a basis for the taking of samples for micropetrographic study.

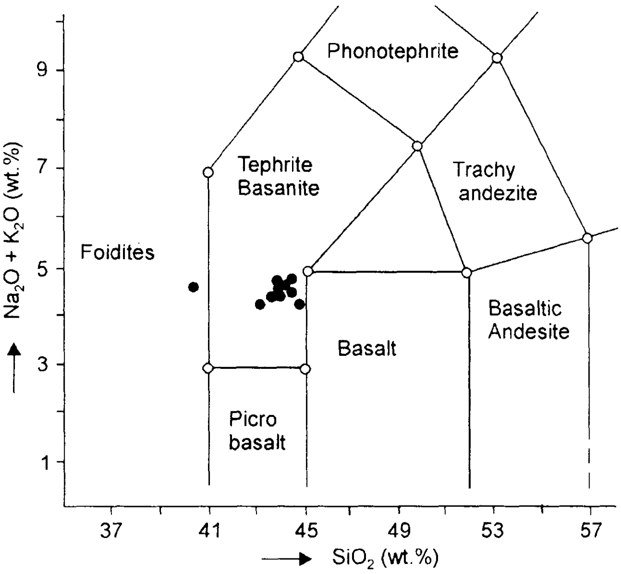

Figure 3. Classification of analyzed basaltoids from Bílčice locality according to the TAS diagram (Na_2O + K_2O:SiO_2) [15].

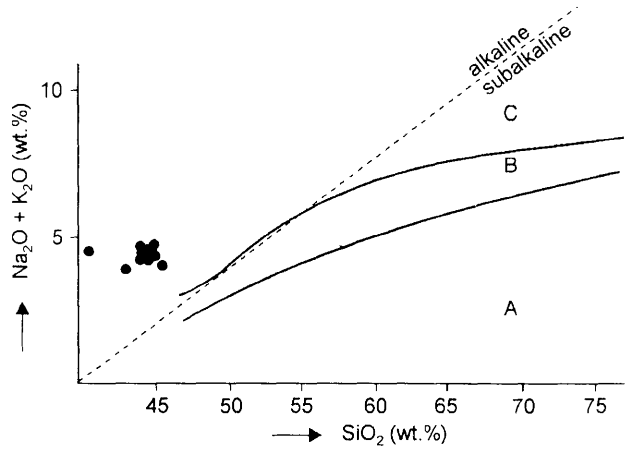

Figure 4. Positions of analyzed basaltoids from the Bílčice locality in the (Na_2O + K_2O): SiO_2 diagram, indicating their character of alkali rocks. Definition of the fields: A - thoileiitic rocks, B - calc-alkaline rocks, C - alkaline rocks, after Kuno [12]. The dashed line dividing effusive rocks into alkaline and subalkaline ones after Mac Donald, Katsura [16].

Table 1. Characteristic petrographic parameters of basaltoids from the Bílčice locality

sample no.	1	2	3	4	5	6	7	8	9	10
structure	or	m	m	or	m	m	or	or	or	or
phenocryst size (mm)	1.2	0.9	1.1	1.3	1.0	1.2	0.8	1.0	1.3	0.8
iddingsite conversion	dist.	none	weak	mean	none	weak	mean	dist.	mean	dist.
matrix texture	of	pil.	of	of	pil.	of	of	of	of	of

Abbreviations: dist. = distinct, or = orbicular, m = massive, of = microophitic, pil. = pilotaxitic

Table 2. Modal composition of the analyzed basalts from the Bílčice locality.

sample no. mineral (wt.%)	1	2	3	4	5	6	7	8	9	10
olivine	17.2	14.6	17.1	18.1	16.6	19.8	17.3	16.7	15.5	16.6
pyroxene	40.0	41.6	40.3	44.7	44.8	40.1	41.6	38.3	37.1	39.5
plagioclase	21.1	19.8	26.4	21.9	20.4	19.4	21.7	22.5	33.2	25.6
magnetite	18.9	12.9	15.2	13.3	17.2	17.8	17.9	21.5	14.2	16.5
"glass"	2.8	1.1	1.0	2.0	1.0	2.9	1.5	1.0	0	1.2

Study of thin sections

First of all, microscopic study has confirmed that all of the basalt samples had a porphyric texture with a predominance of olivine phenocrysts. Exceptionally, they also contained pyroxene which tends to form glomerophyric phenocrysts.

Significant differences can be observed in the character of olivine phenocrysts with respect to their conversion to iddingsite, which is in essence a mixture of iron oxides and clay minerals. A very distinct conversion can be observed on samples 1, 8 and 10, where the minor phenocrysts have already been completely transformed and the largest ones have well defined iddingsite hems

Figure 5. Macrophotograph of the "massive" type of olivine basalt (sample 2).

Figure 6. Macrophotograph of the "orbicular" type of olivine basalt (sample 8).

(figure 7). The second group comprises samples 4, 7 and 9 in which the olivine conversion degree is somewhat lower, exhibiting just narrow iddingsite hems on the largest phenocrysts. The last group consists of samples 2, 3, 5 and 6 which are either completely free of iddingsite (samples 2 and 5) or contain just minute amounts of this mineral (figure 8). In the case of exceptional pyroxene phenocrysts, samples 5, 6 and 8 were found to contain rare grains of hour-glass texture and zonal structure (figure 9). This fact is indicative of an inequilibrial state of the system in which crystallization of mineral phases occurred. As regards the positions of sampling, samples 5 and 6 were taken close to the line dividing the quarry face into a section containing massive and orbicular basalt, and a section comprising solely orbicular basalt.

In all the instances in question, the basic material of the basalts consists of pyroxenes, plagioclases and magnetite. Occasionally, there were also small amounts (up to 3 wt.%) of a mineral with a low refraction index *n* and only partial anisotropy, of allotriomorphic limitation, which could not be more closely identified. In view of the poor anisotropy and the low value of *n* we consider the phase to be vitreous and designate it as "glass" in the quantitative (modal) compositions of the rocks. However, it may also be a mineral from the foids group which cannot be determined optically with any greater precision. Generally speaking, a higher degree of idiomorphy is encountered in the case of plagioclases and magnetite than in that of pyroxenes.

The plagioclases were identified on the basis of the extinction angle in the symmetrical zone, as acid up to basic labradorite. Augite is for the most part involved in the case of pyroxenes.

Magnetite forms well individualized grains, while basalts affected by iddingsite conversion at the expense of olivine show a greater cumulation of magnetite grains in the proximity of converting olivine phenocrysts.

Of considerable significance is the finding of a relationship between the structure of basalts and the texture of their matrix. Petrographic study shows that basalts with a massive structure have a pilotaxitic matrix whereas those of an orbicular structure have characteristically a microophitic structure. At the same time, from the standpoint of absolute grain size, the matrix of massive basalts is somewhat coarser-grained than that of orbicular basalts.

As regards the quantitative representation of the individual mineral phases (table 2), no explicit relationships have been established between the mineral compositions of the two basic textural types of basalts. The mineral composition of all samples shows very small variations.

The partial findings of petrographic study can be summarized as follows:

At present, the extraction level contains two basic types of olivine basalts differing in the following parameters:

1. Olivine basalt with mural jointing, of massive structure, pilotaxitic texture of the matrix, with olivine phenocrysts not affected by conversion to iddingsite.
2. Olivine basalt with prismatic jointing, of orbicular structure, with microophitic texture of the matrix, with olivine phenocrysts distinctly affected by conversion to iddingsite.

Between these limit conditions there are transient types, which in the set in question are best represented by sample 6.

With respect to modal composition, this in principle a single mineral type corresponding to olivine basalt, shows no marked quantitative variations with regard to the given structural and textural types.

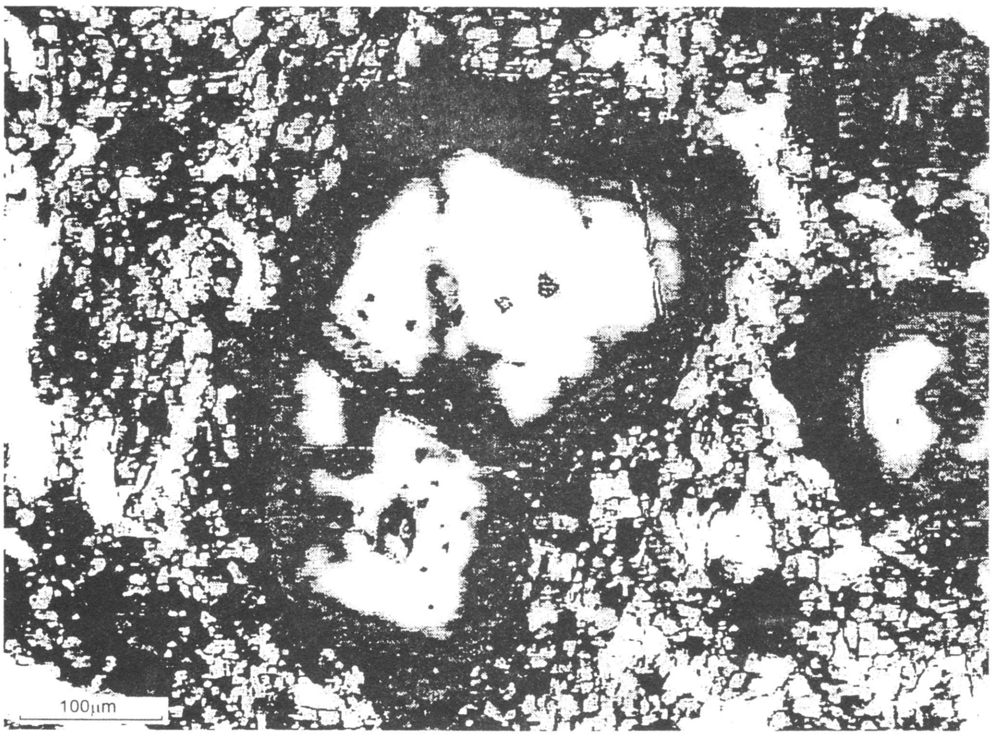

Figure 7. Sample 8, olivine phenocrysts with distinct inddingsite hems. Parallel nicols.

Figure 8. Sample 2, olivine phenocrysts not affected by conversion to iddingsite. Parallel nicols.

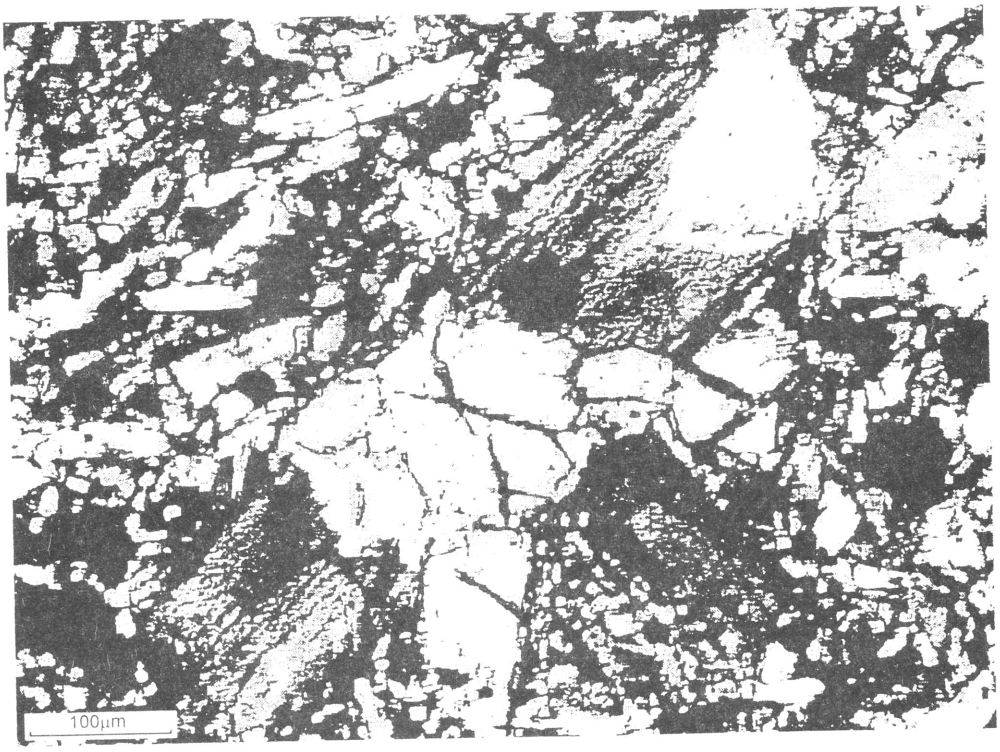

Figure 9. Sample 5, pyroxene phenocrysts with partially developed hourglass texture and visible accretion zones. Crossed nicols.

Geochemical study

The chemical composition of the basalts was determined by wet-way silicate analyses by Mrs. Laborová at the Institute of Geological Engineering of Technical University Ostrava.

The contents of majority oxides are listed in table 3. Let us first carry out a comparison with the optimum chemical composition of petrurgic basalts as given in the literature [13] (wt.%):

SiO_2	43.5 - 47	MgO	8.0 - 11.0
TiO_2	2.0 - 3.5	CaO	10.0 - 12.0
Al_2O_3	11.0 - 13.0	Na_2O	2.0 - 13.5
Fe_2O_3	4.0 - 7.0	K_2O	1.0 - 2.0
FeO	5.0 - 8.0	P_2O_5	5.0 - 1.0
MnO	0.2 - 0.3.		

A comparison of the data shows that the contents of SiO_2, TiO_2, Fe_2O_3, MnO and K_2O vary at the lower limits, while those of Al_2O_3, FeO, MgO, CaO and Na_2O fluctuate at the top limits of the idealized composition of petrurgical basalts.

As far as the contents of the individual oxides are concerned, a certain relationship can only be observed in the behaviour of CaO and MgO where it holds that basalt samples 2 and 4 exhibit the highest contents of CaO (15.27 wt.%) and the lowest contents of MgO (7.56 wt.% and 8.06 wt.%) (cf. table 3). The relation between CaO and MgO at small variations of SiO_2 is also indicated by the classification triangle SiO_2-CaO-MgO (figure 10). A comparison with the phase diagram of the same system after Maun and Osborn [18] (figure 11) shows that the basalts being studied are situated at the stability boundary of tridymite, diopside and protoenstatite where

Table 3. Chemical composition of the Bílčice basaltoids and their calculated normative composition to C.I.P.W.

sample no.	1	2	3	4	5	6	7	8	9	10
SiO_2	43.70	43.97	44.38	43.77	44.56	43.78	40.58	43.69	42.84	44.96
TiO_2	1.93	2.25	1.88	2.31	1.97	2.08	2.13	2.36	2.31	2.31
Al_20_3	13.93	13.61	14.50	13.13	14.50	13.63	14.02	13.69	13.81	14.32
Fe_2O_3	4.38	1.86	2.20	2.59	3.10	1.01	1.12	4.04	5.32	5.77
FeO	6.98	9.18	9.05	8.79	8.15	10.99	10.73	7.37	5.95	5.30
MnO	0.14	0.16	0.15	0.15	0.15	0.14	0.13	0.14	0.14	0.14
MgO	13.10	7.56	10.56	8.06	10.08	9.07	15.12	9.07	11.59	11.09
CaO	11.10	15.27	11.10	15.27	11.80	14.57	10.41	13.88	12.49	10.41
Na_2O	3.61	3.62	3.71	3.59	3.52	3.65	3.66	3.62	3.45	3.50
K_2O	0.89	1.11	1.16	1.01	1.14	1.16	1.10	0.97	0.76	0.86
H_2O^+	0.30	0.01	0.05	0.26	0	0.27	0.70	0.23	0.87	0.65
H_2O^-	0.35	0.29	0.18	0.34	0.29	0.18	0.22	0.37	0.68	0.68

C.I.P.W.

sample no.	1	2	3	4	5	6	7	8	9	10
albite	4.79	-	4.84	-	5.61	-	-	0.95	3.76	16.18
anorthite	15.22	17.86	19.74	16.95	20.61	17.37	18.76	18.46	20.22	21.10
diopside	28.52	45.52	29.11	46.57	30.97	37.35	16.13	40.92	33.50	24.45
ilmenite	3.67	4.33	3.62	4.45	3.78	3.95	4.09	4.54	4.45	4.45
magnetite	6.37	2.74	3.23	3.81	4.54	1.46	1.64	5.93	7.82	8.48
nepheline	13.99	16.83	14.60	16.68	13.26	16.72	16.95	16.28	13.99	7.50
olivine	18.16	6.53	17.91	6.07	14.42	14.93	33.14	7.14	11.72	12.69
orthoclase	5.27	-	6.94	-	6.81	-	-	5.80	4.55	5.15
x Mg	0.87	0.68	0.74	0.72	0.78	0.65	0.76	0.82	0.93	0.96
dicalcium silicate	-	0.97	-	0.73	-	2.85	4.14	-	-	-
leucite	-	5.22	-	4.74	-	5.37	5.15	-	-	-

Normative molecules of the respective minerals to CIPWCALC 1.3:
albite = $Na_20.Al_2O_3.6SiO_2$; anorthite = $CaO.Al_2O_3.2SiO_2$; diopside = CaO.(Fe,Mg)0.$2SiO_2$; ilmenite = $FeO.TiO_2$; hematite = Fe_2O_3; nepheline = $Na_2O.Al_2O_3.2SiO_2$; olivine = 2(Mg,Fe)O.SiO_2; orthoclase = $K_2O.Al_2O_3.6SiO_2$; dicalcium silicate = $2Ca0.SiO_2$; leucite = $K_2O.Al_2O_3.4SiO_2$

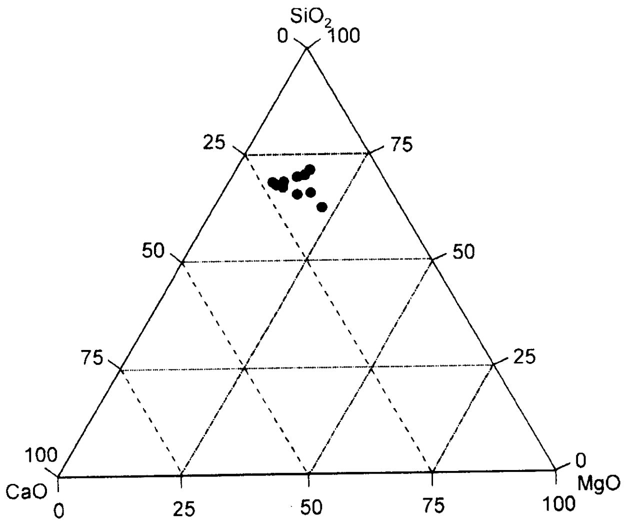

Figure 10. The analyzed basalts in the classification triangle of the system SiO_2-CaO-MgO.

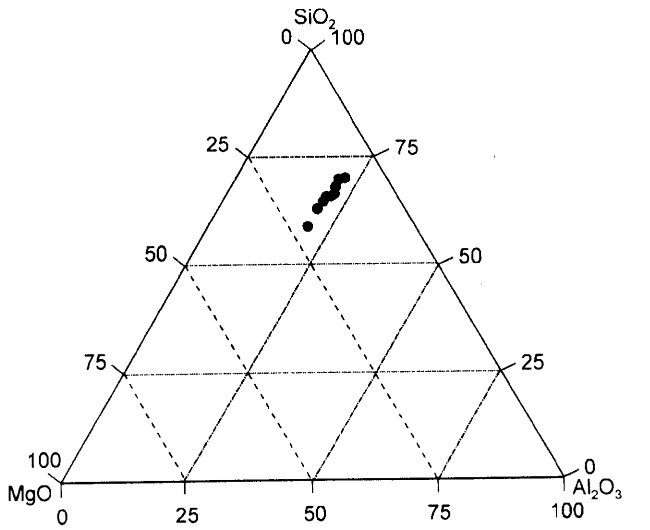

Figure 12. The analyzed basalts in the ternary diagram of the system SiO_2-MgO-Al_2O_3.

the temperature of fusion of totally transformed basalt in dry state can be at about 1400 °C. The same conclusion can be reached by plotting the composition into the ternary diagram of the system SiO_2-MgO-Al_2O_3 (figure 12) and comparing it with the phase diagram by Maun and Osborn [18], figure 13. In this system the basalts being studied are likewise located in the stability region of tridymite and protoenstatite. Moreover, from the system SiO_2-MgO-Al_2O_3 it follows that a relationship between the contents of MgO and SiO_2 exists at almost constant contents of Al_2O_3.

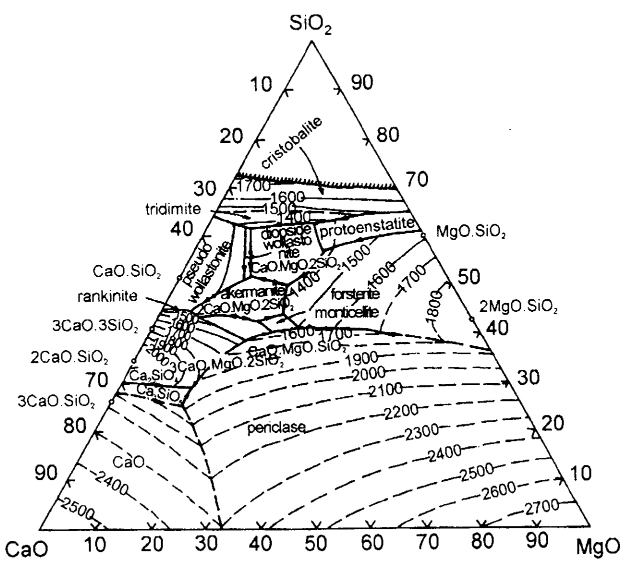

Figure 11. Phase diagram of the system SiO_2-CaO-MgO [18]. The numerical values express the temperature of total fusion.

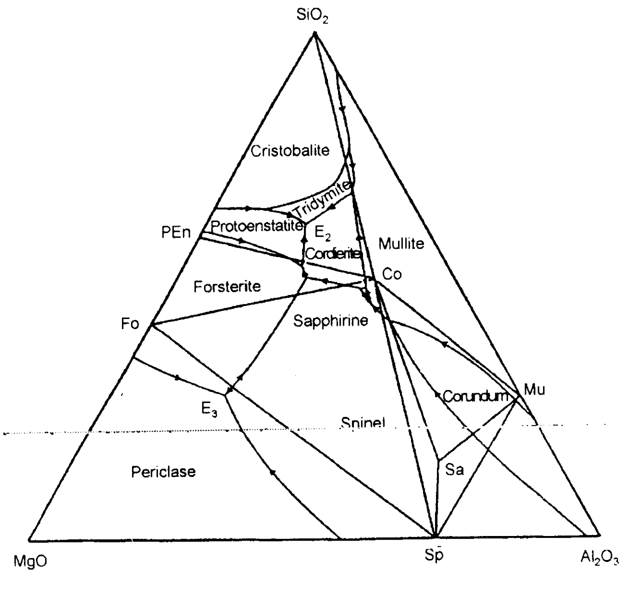

Figure 13. Phase diagram of the system SiO_2-MgO-Al_2O_3 [18].

In the manufacture of rockwool, the basic technological criterion is provided by the so-called acidity coefficient M_k,

$$M_k = \frac{SiO_2 + Al_2O_3}{CaO + MgO} \qquad (1)$$

Its value should be in the range from 1.1 to 3.0 [11]. Ideal technological conditions for fibre drawing are then represented by the value $M_k = 1.65$ [5]. With the basalts investigated, the acidity coefficient ranges from 2.14 to 2.76 (table 4), which is in full agreement with the data

Table 4. Chemico-technological parameters of Bílčice basaltoids significant for fibre drawing

sample no.	1	2	3	4	5	6	7	8	9	10
M_k	2.36	2.52	2.72	2.44	2.70	2.43	2.14	2.50	2.35	2.76
S_1	1.44	1.70	1.69	1.63	1.68	1.63	1.32	1.59	1.26	1.62

by Krutský et al. [11] and Fediuk, Fediuková [5]. In view of the higher acidity coefficient, this has to be adjusted by adding blast-furnace slag to the charge.

A certain precisioning of the M_k value is represented by the so-called S_1 coefficient which includes the effects of Fe oxides and alkali oxides with respect to the main oxides [11]:

$$S_1 = \frac{SiO_2 + 0.5\ Al_2O_3}{1.5\ MgO + CaO + 0.5\ (Fe_2O_3 + K_2O + Na_2O)} \quad (2)$$

To a certain degree, the S_1 coefficient takes into account the effect of the individual oxides on viscosity, and in the case of cupola furnace melting its value should be within the range of 1.0 to 1.5 [11]. Table 4 shows that the basaltoids in question have S_1 coefficients close to the top limit of this optimum interval.

The silicate analyses were also utilized for elucidating the petrographic character of the rocks by means of the TAS classification diagram for eruptive rocks [15], and by means of the classification after Hutchinson [7], based on C.I.P.W. values and on the conclusions by Green and Ringwood [26] which demarcate the boundaries for the rock association alkali olivine basalt - nepheline basanite - olivine nephelinite. The significance of the present chemical analyses is emphasized by the fact that the authors in one of their more recent studies [5] dealing with the chemisms of neovulcanites from all over North Moravia used the results of as few as 22 chemical analyses.

New petrological and geochemical findings and their relation to the technology of rockwool production

The petrological study focused on the technological (petrurgical) properties of basalts established a lower content of leucocratic minerals, namely plagioclases, and absence of modal foids, both nepheline or leucite, which were all described in the past as constituting a part of the Velký Roudný lava streams. The presence of foids was determined solely on the basis of calculation of normative mineral phases according to C.I.P.W. [9], table 3. The calculation was carried out by means of the CIPWCALC 1.3 program written by Dr. K.H. Schmidt of the Göttingen University. As far as standard composition is concerned, Hutchinson´s classification ranks the rocks among nepheline basalts.

The contents of modal plagioclases ranging from 20 wt.% to 35 wt.% are significantly lower than those specified for classical petrurgical basalts, where the sum of plagiclases and foids is given at 40 to 50 wt.% of the modal composition [13]. The lower plagioclase contents arise above all at the expense of higher contents of standard nepheline or leucite, and also a higher content of opaque mineral - magnetite. The content of the latter varies over the range of 13 wt.% to 21 wt.%, whereas in classical petrurgic basalts the magnetite content is about 10 wt.%. This fact have unfavourable effects on the melting process where coke acts as a reducing agent and iron oxides are the first to melt during the fusion process.

This factor will play a still more significant role with basalts which in this study are designated as basalts with an orbicular structure, microophitic texture of the matrix, and by a distinct conversion of olivine phenocrysts to iddingsite, which is defined as a mixture of Fe oxides with clay minerals. The matrix of this type of basalts contains, apart from individualized magnetite grains, also iron oxide pigments. All this must necessarily have further negative effects on uniformity of charge melting, and possibly can also cause melt frothing resulting from the presence of secondary minerals containing H_2O. In consequence of this it is necessary to discontinue more frequently the melting process in order to tap the molten iron.

It may be concluded that of the raw materials extracted from the Bílčice deposit for the purposes of petrurgical processing, technologically more advantageous are the basalts with a massive structure and pilotaxiltic texture of the matrix, in which the olivine phenocrysts have not yet been converted to iddingsite, and in which the individualized magnetite grains are more uniformly distributed.

Chemical analyses confirmed indistinct variations in the chemical composition of the individual types of basalts, which were also related to the overall composition of the mineral phases. The relatively high values of the acidity coefficient, which were in agreement with the data published by Fediuk and Fediuková [5], are for technological purposes adjusted by additions of blast-furnace slag. A comparison of the chemical characteristics of basalts with phase diagrams of the systems SiO_2-CaO-MgO and SiO_2-MgO-Al_2O_3 showed that the basalts in question are stable in the regions of tridymite, protoenstatite and possibly also diopside. To this corresponds the temperature of total fusion of basalt of about 1400 °C.

CONCLUSION

The main result of the field and laboratory investigations is the finding that the basalt from the Bílčice quarry, characterized as massive olivine basalt, is more advantageous for petrurgical processing.

This type of basalt can also be readily identified thanks to its massive structure, mural jointing and a stable dark grey colour, and can be easily distinguished in the extracted rock from the olivine basalt with an orbicular structure, which is less suitable for petrurgical purposes.

As far as practical extraction problems are concerned, this would mean preferential extraction of petrurgical basalt in the western to north-western part of the quarry, from the level base up to about one half of the face height. Continued extraction of high-grade basalt not only for petrurgical purposes in future could be ensured by opening a new level in the western part of the quarry, where massive basalt forms the bottom part of the extraction face, submerging to the east and south-east below the present extraction level. This is a logical consequence of the fact that the footwall of the extraction level is horizontal and the Chřibský les lava stream is inclined at an angle of 10 to 20 degrees in the SE direction, which is in fact the present direction of the extraction advance.

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VÝZNAM TEXTURNÍCH A STRUKTURNÍCH VLASTNOSTÍ SEVEROMORAVSKÝCH BAZALTOIDŮ PRO VÝROBU MINERÁLNÍCH VLÁKEN

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Současné požadavky kladené na bazaltoidy, použitelné pro výrobu minerálních vláken, jsou všeobecně spojovány zejména s vhodným chemickým a mineralogicko-petrografickým složením suroviny a s jeho malou variabilitou. Tyto parametry totiž zcela zásadně ovlivňují proces tavení horniny a viskozitu vzniklé taveniny.

Podrobné petrografické studium bazaltoidních hornin z lokality Bílčice ukázalo, že dosavadní nároky je nutno navíc rozšířit o strukturně texturní kritéria, neboť zde těžená surovina má sice stálé chemické i mineralogické složení, avšak přesto vykazuje v procesu tavení rozdílné chování. Tato skutečnost je výsledkem existence dvou zjištěných stavebních typů bazaltoidních hornin na ložisku:

1. horniny s masivní texturou a pilotaxitickou strukturou základní hmoty
2. horniny s orbikulární texturou a mikroofitickou strukturou základní hmoty.

Pro účely tavení jsou z lokality Bílčice výhodnější bazalty charakteristické svou masivní texturou a pilotaxitickou strukturou základní hmoty, v nichž fenokrysty olivínu nejsou postiženy přeměnou na iddingsit (směs oxidů železa a jílových materiálů) a dobře individualizovaná zrna magnetitu jsou v hornině rovnoměrněji rozložena.

Naopak jako nevhodný se z hlediska tavicích poměrů ukázal typ s orbikulární texturou, u nějž jsou fenokrysty olivínu postiženy výraznou přeměnou na iddingsit a v základní hmotě je mimo individualizovaná zrna magnetitu přítomen také pigment oxidů železa. Zjištěné skutečnosti se následně v tavicí peci projevují nerovnoměrným tavením vsázky, protože koks jako redukční činidlo se nejdříve podílí na redukci oxidů železa na Fe. Ve svém technologickém důsledku to znamená nutnost častějšího přerušování tavby, spojeného s odpouštěním železa.