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GRANITOID ROCKS OF THE SOUTHWESTERN PART OF THE VEPORIDE CRYSTALLINE COMPLEX

(Fig. 1—8)

Abstract: The paper deals with hitherto results of field and laboratory study of granitoid rocks from the southwestern part of the Veporide crystalline complex. From these results it follows that granitoid rocks show in sense of the IUGS classification generally the character of tonalites, granodiorites and granites, with gradual transitions between the differentiated groups. The occurence of tonalites at the highest situated points of the studied area indicates the existence of an intermediate central part of the Veporide granitoid body. Petrochemical investigation of the classified granitoid rock groups of the studied region points to the fact that these are products of differentiation of an alkaline — calcic magma, generated by anatexis of gneisses in the sense of H. G. F. Winkler (1974).

Резюме: В статье приводятся результаты полевых и лабораторных работ по изучению гранитоидных пород югозападной части вепоридных кристаллических комплексов. Результаты исследований показывают на то, что гранитоидные породы по данным международной классификации (IUGS) имеют характер тоналитов, гранодиоритов и гранитов с постепенным переходом между этими группами. Присутствие тоналитов в наиболее высоких местах изучаемого района потверждает существование центральной части вепоридного гранитоидного массива переходного состава. Петрохимические исследования этих классифицированных групп гранитоидных пород в изучаемой области показывает на то, что эти продукты дифференциации щелочно-известковой магмы образовались из гнейсов анатектическим путем (по Х. Г. Ф. Винклеру, 1974).

Introduction

In the crystalline complex of the West Carpathians granitoid rocks prevail over crystalline schists. Their prevalent mass occurs in the Tatride and Veporide crystalline complexes. Their exposure in Spišsko-Gemerské rudohorie Mts. is confined to small areas only.

The works so far dealing with granitoid rocks (J. Koutek, 1930; V. Zoubek, 1936; P. Ončáková, 1954; J. Kamenický — L. Kamenický, 1955; B. Cambel — J. Valach, 1956; A. Gorek, 1956; M. Ivanov, 1957, M. Ivanov — L. Kamenický, 1957; D. Kubíny, 1958, 1959, 1962; E. Krist, 1960a, b, et al.), gave a more or less detailed petrographic and partly also petrochemical characteristics of the classified basic types of the particular massif, as well as their partial comparison with granitoid rocks of other Core mountains of the West Carpathians. This stage of treatment resulted from the fact applying even in present time, that there is a lack in suitable geological mapping material, which is a basic requirement for the study of geological structure and microtectonic petrographic, mineralogic,

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chemical investigation and neither in the period existed conditions for complex geochemical – mineralogical research.

In view of the mentioned facts, along with a great team of scientifists I directed attention to the study of granitoid rocks of the Veporide crystalline complex, actually to its major body, namely to its southwestern section, roughly between the settlements Sihla–Hriňová and Kriváň on northwest and Rimavská Baňa – České Brezovo and Tuhár at southeast. In order of prompt and effective knowledge of its structure, petrography, petrochemistry of this complex, we decided to construct structure – lithological profiles of 2–3 km width and different length. In the profiles also crystalline schists are included. in order to study the interrelations between the granitoid body and the crystalline schists, as well as the effects of the granitoid body on the crystalline schists.

Geology of the SW part of the granitoid massif

The central granitoid body of the Veporide crystalline mass (in sense of the geological structure of A. Klinec 1966) is in nappe position to the Hron complex. In turn from mapping works which I conducted in the years 1960 to 1965 and 1975–1977 in the southwestern part of the Veporide crystalline complex it follows, that the granitoid body is however partly thrust on the crystalline schists, though its nappe position is not assumed. The dip of the thrust plane is rather variable. For example in the valley Kamenistá it ranges about 20–30° to SE. In the region of the el. point Pod Skalicou and at other sites it varies from 30° up to 60° towards SE up to S.

The granitoid body is in regional extent affected by different grade of tectonic reworking. Its result is the formation of tectonic deformations, along which various broad zones of mylonitized to phyllonitized granitoid rocks had originated.

As it was above mentioned, the granitoid body, namely its northwestern boundary towards its mantle is tectonic. The crystalline schists in direction towards the granitoid body show increasing character of the migmatitization to granitization process. The author of this paper in 1961 already (E. Krist in B. Cambel – J. Kamenický – E. Krist, 1961) pointed to the direct dependence of these processes on the largest granitoid body of the Veporide crystalline complex.

Following present knowledge it may be stated, that the primary structural – geological position of the investigated granitoid body may be characterized by the fact that in the evolution of the geological structure of this Veporide crystalline section the granitoid body entered in consistent position to the structure of the adjacent crystalline schists. In addition to the above mentioned facts also xenoliths of crystalline schists preserving the same trend like the adjacent crystalline schists point to this position of the granitoid body. Primary contacts to the crystalline schists were accompanied by migmatite up to hybrid granitoid formation.

General petrographical characteristics of the granitoid body

On the basis of former field study we give in this part some observed facts characterizing particularly the southwestern part of the investigated granitoid body, as this displays also on the geological – petrographical profile, from the

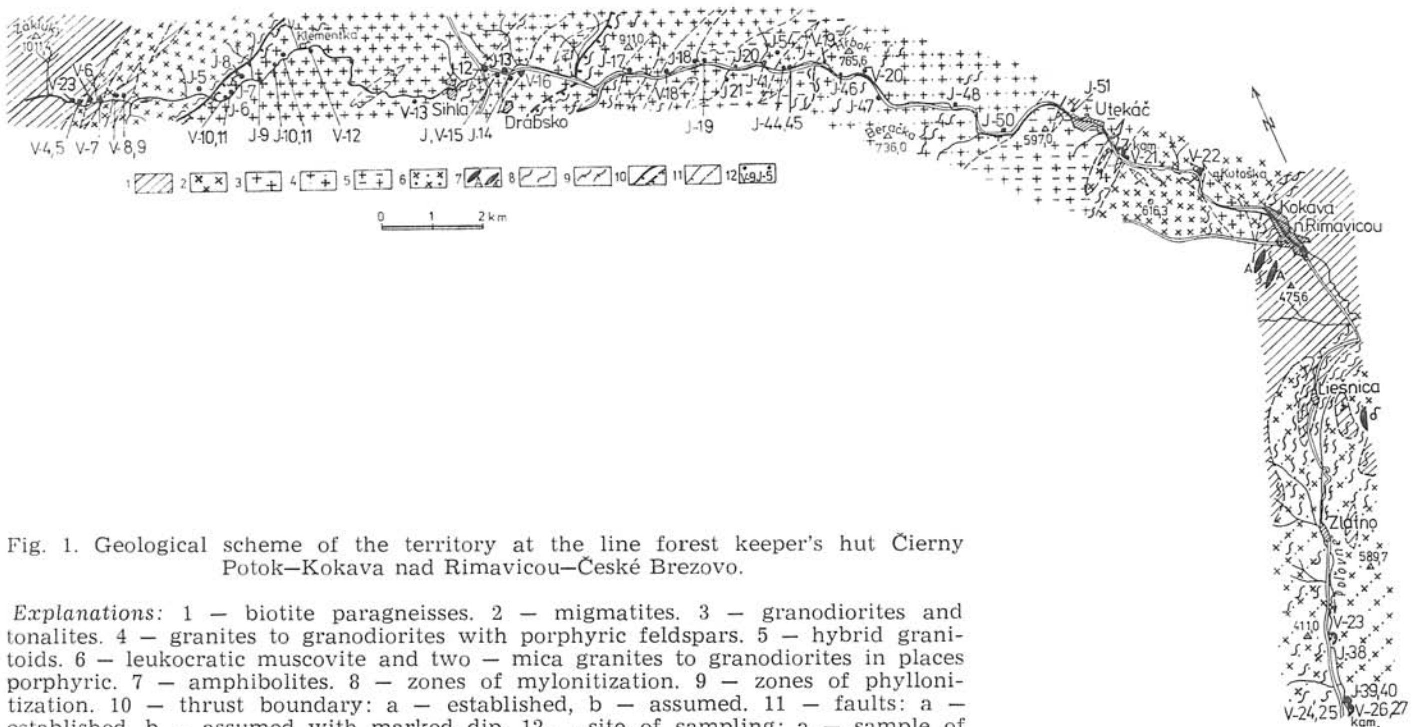

Fig. 1. Geological scheme of the territory at the line forest keeper's hut Čierny Potok–Kokava nad Rimavicou–České Brezovo.

Explanations: 1 – biotite paragneisses. 2 – migmatites. 3 – granodiorites and tonalites. 4 – granites to granodiorites with porphyric feldspars. 5 – hybrid granitoids. 6 – leukocratic muscovite and two – mica granites to granodiorites in places porphyric. 7 – amphibolites. 8 – zones of mylonitization. 9 – zones of phyllonitization. 10 – thrust boundary: a – established, b – assumed. 11 – faults: a – established. b – assumed with marked dip. 12 – site of sampling: a – sample of 30–50 kg. b – of 0.5 – 1 kg sample for the determination of rock radioactivity.

forest-keepers' house of Čierny Potok in the valley Kamenistá dolina and along the valley of the river Rimavica (Fig. 1).

Further on brief petrographic characteristics of some basic types only is given, because for the characterization of some other types samples should be taken from several localities of the province where they do appear.

Analogously as on the above mentioned profile (Fig. 1) we find even beyond it considerable representation of so called hybrid granitoids, situated at the marginal part of the studied granitoid body. This is recognizable particularly at its northwestern boundary. I hold this type of granitoids for rocks of the reworked mantle. The contact of the granitoid body with its mantle is at present tectonic, this fact was referred to by E. Krist (1966) already, nevertheless, it is more than probable that this granitoid rock type had passed over continuously to migmatite rocks found in their vicinity prior to the thrust of the compact part of this body on the crystalline schists.

Another pecularity is the comparatively frequent occurence of mantle xenoliths in different sizes. The presence of these xenoliths of crystalline schists is not characteristic only for the marginal parts of the granitoid body, but also for its innermore sections, where they appear in less amount, however. The orientation of these xenoliths is identic with the trend of the adjacent crystalline schists not only in the marginal, but also in the central part of the body. We notice however, cases with NW – SE orientation of large mantle xenoliths in the granitoid body. This orientation of the mantle xenoliths was found in the province between Utekáč and Kokava nad Rimavicou.

On the basis of so far performed field study a relatively abundant extension of crystalline schists (biotite paragneisses with ptygmatitic folds) has been established between the villages Ďubákovo–Ipeľský Potok–Malinec. In the total above delimited region granitoid rocks were drawn being assigned to biotite granodiorites up to qurtzdiorites, with transitions to syntectic porphyry granitoids with pink potash feldspars.

Petrographical characteristics of some basic granitoid types

On the area forming the subject of the research several fundamental granitoid types were differentiated on the basis of geological mapping:

1. biotite granodiorites in places leukotonalites (trondhjemites), denominated also Sihla type. The more leukocratic facies of this rock belongs to leukotonalites;
2. porphyric biotite granites with white porphyric potash feldspar "xenocrysts", designated Vepor type;
3. porphyry granites up to granodiorites with pink porphyric potash feldspar "xenocrysts", working designation Ipeľ type;
4. leukocrate granitoids of aplitoid and pegmatitoid nature;
5. aplite and pegmatite veins;
6. hybrid granitoids.

Biotite granodiorites to trondhjemites

Biotite granodiorites (in places leukotonalites – trondhjemites) belong to the most widespread type, designated by V. Zoubek (1936) Sihla type. The rock is characterized macroscopically by medium – granular development. At first sight it gives the impression that a rock of hap – hazard structure is concerned with regular spatial extension of basic mineral constituents. By detailed macroscopic investigation we notice, that it rarely appears primarily or secondarily unoriented. Neither the distribution of the main constituents, particularly of biotite is homogenous in space. Partial orientation appears which might be due either to crystallization in the pressure field, or an imperfect palimpsest after the original rock may be concerned. The described type builds 60–70 % of the granitoid body not only in the investigated profile, but also in the whole southwestern section. We can study it also in other profiles, as in the cut of the state road Lom nad Rimavicou–Hriňová, or in the profile of the road Hriňová–Detvianska Huta.

In tectonically faulted zones its kakiritization up to mylonitization set in and in zones of most intensive tectonic reworking originated sericite – chlorite schists.

The colour of the described basic type is lightgreenish grey. From light components feldspars (plagioclases and potash feldspar), quartz and biotite may be recognized macroscopically. The presence of titanite crystals often reaching 0,5 cm up to 1 cm size is a characteric feature of this type.

Essential minerals are quartz, plagioclases, biotite. Potash feldspar content varies in the scope of accessory up to substantial amounts, which fact is caused by weak kalium metasomatism. These metasomatic feldspars do not form porphyroblasts in this rock type, but they reach the size of other essential components and their colour is pink or pinkish.

Porphyric biotite granites

This variety of granitoid rocks appears particularly in the northwestern part of the granitoid body. It is the "Vepor" type. This granitoid rock type occurs south of the village Dobroč, for example in the region of the el. point Strungovo, north of the el point Nad Králičku, in the region of Šopisko, Ilkovo and at other sites. These rock types are characterized by the presence of porphyric feldspars in the basic medium – grained mass. Porphyric feldspars are built not only by potash feldspars, but also by plagioclases and they attain locally up to 4 cm sizes. Twinning after the Carlsbad law appears often. The relation of the mentioned feldspar individuals to the matrix varies considerably. They are generally almost white and thus differ from similar granitoid rock types, in which porphyric feldspars are pink or pinkish and appear prevalently at the southeastern border of the granitoid body.

Porphyric granites up to granodiorites with pink porphyric feldspars

At the beginning of this chapter we mentioned already that these granitoid rocks are denominated for working purpose "Ipeľ" type. They occur generally in the southeastern part of the granitoid body. We find them in typical development for example in the valley Rimavica on a state road cut in the region of Ďurkovka, ca 250 m SE from the forest keeper's hut, at an exposure NE of the el. point 702,5, ca 170 to 200 m, and south from the el. point Hrbok (765,6) in the cut of the road leading to Utekáč.

This granitoid rock type is characterized by the presence of pink porphyric feldspars in the medium-grained matrix. Porphyric feldspars attain up to 3 cm sizes. Their size varies in average about 1 cm. During tectonic reworking the rock gained the character of augen texture mylonite. The eyes are formed by potash feldspar up to 0,8 cm in size. Also in this granitoid rock type may be found relicts of crystalline schists.

The matrix is made up of feldspars, quartz and biotite, and its colour is greyish — brown.

The rock is microscopically of porphyric texture. The texture of the matrix is allotriomorphous granular. The rocks are affected by weak to medium manifestations of cataclasis. Essential minerals are: quartz, feldspars, biotite.

Leukocratic granodiorites up to granites of aplitoid to pegmatitoid character

As it follows from the headline this type of granodiorites to granites may be of aplitic as well as pegmatitic nature. Their general feature is the low darkness index. Biotite is in the rule lacking. These "granitoid" rock types

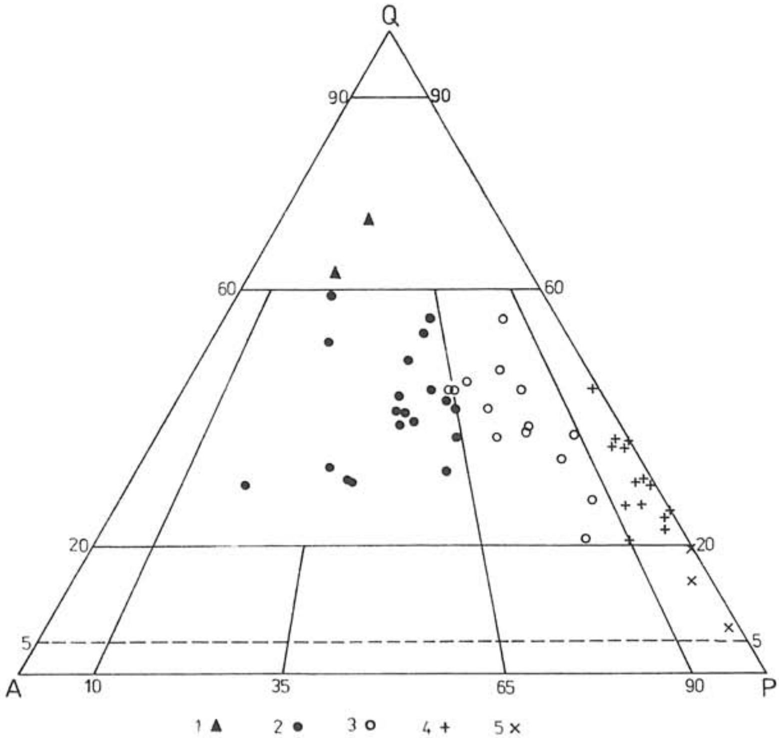

Fig. 2. The position of the studied granitoid rocks in the triangle Q—A—P, according to the IUGS classification.

Explanations: 1 — granitoid rich in quartz. 2 — granite. 3 — granodiorite, 4 — tonalite. 5 — quartzdiorite.

appear at various sites, on the map – sheet Lom nad Rimavicou, Hriňová etc. The samples V -12, V- 16 are their representatives (Fig. 1). Analogous rocks occur also on the sheet Čierny Balog, for example in the valley Brotovo.

In both cases these rocks are macroscopically of light greyishwhite colour in the aplitic types, and beige – pink at the pegmatitic types, like in the sample V-12, or 16a. The aplitic types are finer – grained, the pegmatitic types are coarser – grained.

Aplitic granite types (V-16) are of greyish – white colour, medium – granular, of hap – hazard structure. Macroscopically may be distinguished quartz and milky white feldspars, belonging to the essential constituents. Large porphyric feldspars up to 1 cm in size may be found sporadically.

Hybrid granodiorites

From the presented petrographic description it results, that the lithology of the rocks from the "granitoid" body is rather intricate. Its complexity is allied to "assimilation" processes of the mantle and to metasomatic processes, on the other hand to considerable activity of dynamometamorphism. As it was stated by K. Siegl (1978), about 10 percent of rocks generated primarily by the pluton, cannot be designated on the cut plane as typical "granitoids". As

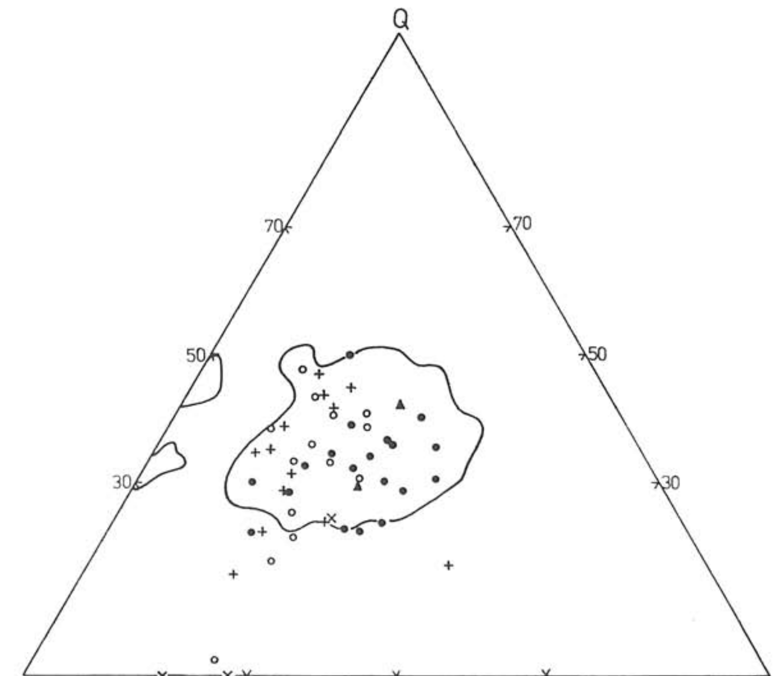

Fig. 3. The position of the studied granitoid rocks in the Q–Ab–Or diagram (according to H. G. F. Winkler, 1974). *Explanations:* see Fig. 2.

it was stated on the previous pages, we find hybrid types particularly at the borders of the "granitoid" body. They occur, however, also at its innermore segments. These are rocks of the reworked mantle and of "granitoids" contaminated by the mantle. These rocks being no typical migmatites are designated "hybrid granitoids". This "granitoid" type is represented by samples V-26, taken from the quarry north of České Brezovo about 250 m.

Macroscopically it is medium — grained, of greyish — white colour. The schlieren are due to increased concentration of biotite. Porphyric feldspars reaching 1,5 cm sizes appear. Their average size varies in the range of 0,5—1 cm.

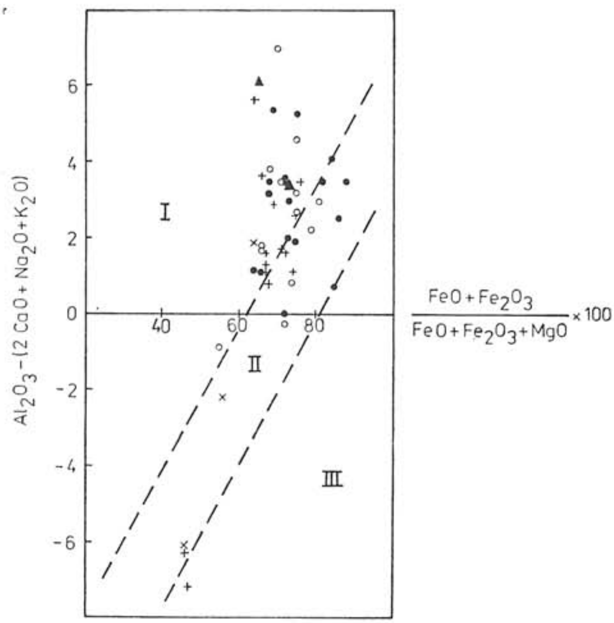

Fig. 4. Diagram of the studied granitoid rocks in the coordinates Fe—Al (according to V. A. Kutolin, 1964). *Explanations:* I — palingenous and anatectic granites. II — field of uncertainty. III — granites (basalt magma differentiates).

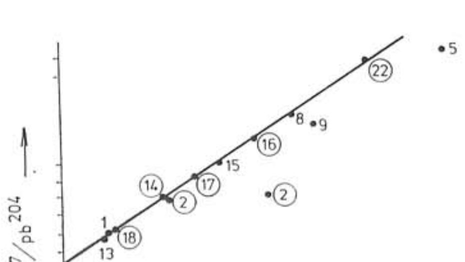

Fig. 5. Representation of isochrons of some granitoid rocks of the West Carpathians. The numbers 13, 14, 15 are granitoid rocks of the Veporide granitoid massif from the investigated region) according to B. Cambel et al. 1977).

Microscopically the rock is of porphyric texture with allotriomorphic matrix and implication of imperfect hypidiomorphic texture. The porphyric character of the texture is due to the presence of potash feldspar porphyroblasts. To substantial minerals belong quartz, plagioclases, K — feldspars and biotite. Accesories are represented particularly by apatite, zirkon, garnet, muscovite.

Considering closer the differentiated granitoid rock types in view of field mapping and comparing their projection points in the Q—A—P triangle, we find an excellent consistence. The type designated as Sihla, corresponding to our classified type 1 has all projection points in the field of quartz diorite and tonalite. It is similar as at the other two basic types. Porphyry biotite granites

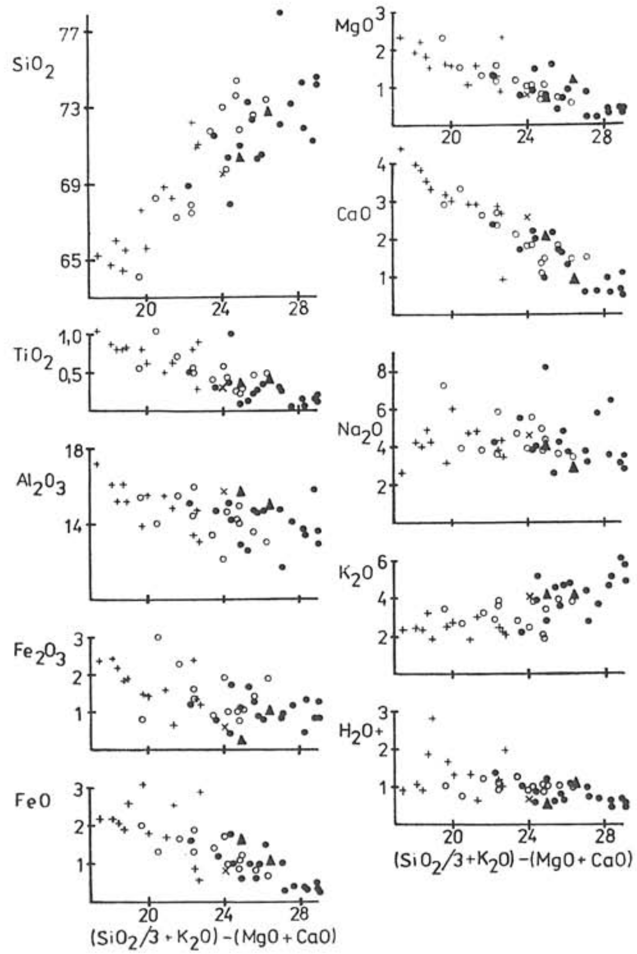

Fig. 6. Correlation diagrams of SiO_2, TiO_2, Al_2O_3, FeO, MgO, CaO, Na_2O, K_2O and H_2O content dependence of the investigated granitoid rocks of the Veporide massif on their number of position $(SiO_2)3 + K_2O-$ $(MgO + CaO)$.

Table 1
Planimetric analyses of granitoid rocks

No	Sample	Quartz	K-feld-spar	Plagio-clases	Horn-blende	Bio-tite	Mus-covite	Tita-nite	Apa-tite	Orthi-te	Mag-netite	Epi-dote zoizite	Acc. mine-rals	Gar-nets
1	V-10	+19,51	3,44	69,26	—	7,30	0,19	0,05	0,04	—	0,04	—	—	—
		26,9	2,0	60,7	—	9,0	+	—	—	—	—	—	1,4	—
2	V-11	+22,64	1,41	66,82	—	7,86	0,34	0,30	0,09	—	0,54	—	—	—
		-23,2	2,8	61,0	—	10,1	1,1	—	—	—	—	—	1,8	—
3	V-12													
		41,0	20,1	44,6	—	1,3	2,2	—	—	—	—	—	0,8	—
4	V-13	+19,46	6,97	61,41	—	10,89	0,21	0,79	0,16	0,09	0,01	—	—	—
		22,3	4,5	58,4	—	11,0	0,8	—	—	—	—	—	3,0	—
5	V-14	+17,43	8,89	61,28	—	10,67	1,10	0,40	—	0,22	—	—	—	—
		18,3	11,4	56,3	—	9,8	2,3	—	—	—	—	—	1,9	—
6	J-6	25,4	1,0	56,9	—	11,6	2,0	—	—	—	—	—	3,1	—
7	J-7	23,8	0,3	56,9	—	15,0	1,8	—	—	—	—	—	2,2	—
8	J-8	18,2	1,5	60,5	—	13,7	3,7	—	—	—	—	—	2,4	—
9	J-9	30,8	2,0	53,1	—	6,8	1,0	—	—	—	—	—	6,3	—
10	J-10	20,1	1,0	62,1	—	10,5	1,8	—	—	—	—	—	4,4	—
11	J-11	32,4	0,8	58,7	—	5,2	+	—	—	—	—	—	2,9	—

12	V-15	+39,11	11,64	43,78	—	4,55	0,16	0,19	0,12	—	—	0,44	—	—
		40,0	9,4	41,0	—	4,7	2,9	—	—	—	—	—	2,0	—
13	V-16	30,1	48,5	17,7	—	—	3,4	—	—	—	—	—	0,5	—
14	V-17	+62,39	16,91	7,84	—	12,79	0,10	—	—	—	0,06	—	—	—
		59,3	14,6	9,7	—	4,7	11,3	—	—	—	—	—	0,4	—
15	V-18	+35,87	10,80	41,40	—	11,32	0,20	0,30	0,15	—	—	—	—	0,03
		35,0	13,5	35,8	—	11,8	3,0	—	—	—	—	—	0,9	—
16	J-12	39,5	24,4	26,3	—	1,2	6,1	—	—	—	—	—	2,5	—
17	J-13	33,1	15,1	41,0	—	8,3	+	—	—	—	—	—	2,6	—
18	J-14	45,2	16,0	23,9	—	1,4	12,0	—	—	—	—	—	1,5	—
19	J-15	31,7	41,0	25,4	—	0,1	1,2	—	—	—	—	—	0,6	—
20	J-17	15,1	+	54,4	—	19,6	1,3	—	—	—	—	—	9,6	—
21	J-18	22,4	7,7	52,9	—	16,3	+	—	—	—	—	—	0,7	—
22	J-19	27,7	50,4	15,0	—	2,9	3,5	—	—	—	—	—	0,5	—
23	J-44	34,1	15,0	27,9	—	12,2	7,0	—	—	—	—	—	3,8	—
24	V-20	+35,28	19,77	37,12	—	7,47	0,11	0,01	0,07	—	—	—	—	0,15
		37,0	18,7	34,1	—	8,4	1,0	—	—	—	—	22,19	0,8	—
25	V-20	+43,44	19,12	25,25	—	9,85	0,13	—	0,01	—	—	—	—	—
		42,2	19,9	24,0	—	6,9	4,3	—	—	—	—	—	2,7	—

Continuation to Tab. 1

No	Sample	Quartz	K-feld-spar	Plagio-clases	Horn-blende	Bio-tite	Mus-covite	Tita-nite	Apa-tite	Orthi-te	Mag-netite	Epi-dote zoizite	Acc. mine-rals	Gar-nets
26	J-46	35,0	13,6	28,6	—	14,4	4,4	—	—	—	—	—	4,0	—
27	J-47	44,7	15,6	33,4	—	3,1	2,2	—	—	—	—	—	0,8	—
28	J-20	40,3	20,5	30,2	—	5,0	1,7	—	—	—	—	—	2,3	—
29	J-5	30,4	10,5	39,6	—	16,5	+	—	—	—	—	—	3,0	—
30	V-24	15,8	6,0	55,0	—	22,6	+	—	—	—	—	—	0,6	—
31	J-21	41,4	12,6	20,9	—	8,9	12,4	—	—	—	—	—	3,8	—
32	J-41	36,2	25,3	27,1	—	8,6	1,2	—	—	—	—	—	1,6	—
33	J-51	3,0	0,5	29,4	37,1	16,8	—	—	—	—	—	—	13,3	—
34	J-54	+29,01	23,93	39,90	—	6,90	0,16	—	0,10	—	—	—	—	—
		28,6	23,7	37,5	—	9,5	+	—	—	—	—	—	0,7	—
35	V-23	+10,08	—	33,81	52,2	0,65	—	1,03	0,09	—	—	2,14	—	—
		11,5	—	31,2	53,0	0,8	—	—	—	—	—	—	2,5	—

36	V-25	*32,06	8,45	54,34	—	5,03	0,12	—	—	—	—	—	—	—
		30,08	9,3	50,9	—	6,1	2,4	—	—	—	—	—	0,5	—
37	V-26	*32,40	6,40	50,39	—	10,30	0,41	—	0,09	—	—	—	—	—
		32,6	5,5	48,5	—	10,6	2,0	—	—	—	—	—	0,8	—
38	V-27	*33,75	16,78	46,85	—	3,13	+	—	—	—	0,03	—	—	—
		34,3	21,0	37,6	—	5,6	+	—	—	—	—	—	1,5	—
39	J-38	55,4	23,1	10,2	—	4,6	6,1	—	—	—	—	—	0,6	—
40	J-39	10,3	0,0	18,0	45,5	25,2	—	—	—	—	—	—	1,0	—
41	J-40	12,8	2,1	73,2	—	6,7	0,9	—	—	—	—	—	4,3	—

Samples no. 1—11 belong to the Sihla type
Samples no. 12—23 belong to the Vepor type
Samples no. 24—27 belong to the Ipeľ type
Samples no. 28—33 belong to hybrid granitoids
Samples no. 34—41 belong to the granitoid body Sinec

* Quantitative analysis performed by the planimetric method
The other quantitative analyses were performed by the point method

Table 2

Samples beyond the profile

No.	Sample	Quartz	K-feld-spar	Plagio-clases	Horn-blende	Bio-tite	Mus-covite	Tita-nite	Apa-tite	Orthi-te	Mag-netite	Gar-nets	Epi-dote zo-izite	Acc. mine-rals	Other acc. mine-rals
1.	J-22	43,5	10,4	37,5	–	5,3	1,6	–	–	–	–	–	–	1,7	–
2.	J-23	29,1	38,6	29,4	–	–	2,6	–	–	–	–	–	–	0,3	–
3.	J-24	33,8	11,2	42,8	–	6,0	4,0	–	–	–	–	–	–	2,0	–
4.	J-25	31,2	1,5	52,3	–	10,7	2,7	–	–	–	–	–	–	1,6	–
6.	S-1	+42,15	12,66	28,59	–	7,0	1,02	–	–	–	–	–	6,47	0,63	1,48
5.	S-2	+26,33	8,89	41,01	–	15,89	–	0,87	–	–	–	–	3,98	1,96	0,94
7.	Ve-1	+43,58	29,71	14,83	–	6,04	0,89	–	–	–	–	–	–	0,27	4,68
8.	Ve-2	22,17	50,34	14,42	–	10,56	0,76	–	–	–	–	–	–	0,52	1,23

Table 3

Chemical analyses of granitoid rocks

No	Sample	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	^+H_2O	^-H_2O	Sum.
1	V-10	65,27	1,18	17,25	2,36	2,20	0,01	4,37	2,30	2,56	2,30	st	0,87	0,05	100,72
2	V-11	71,05	0,91	12,94	1,19	2,89	0,04	0,86	2,28	3,44	2,14	0,26	1,94	0,11	100,05
3	V-12	77,94	0,26	11,67	0,97	0,28	0,03	1,53	0,19	3,28	2,80	0,06	0,74	0,13	99,88
4	V-13	72,17	0,78	13,41	2,38	0,85	0,05	2,84	1,24	3,64	2,44	0,32	1,11	0,11	101,34
5	V-14	68,20	1,06	13,96	2,99	1,26	0,05	3,33	1,48	3,88	2,60	0,29	0,73	0,02	99,85
6	J-6	64,68	0,87	16,06	2,41	2,17	0,06	3,96	1,86	4,12	2,36	0,00	1.05	0,10	99,70
7	J-7	65,97	0,81	15,18	2,18	2,07	0,06	3,83	1,82	4,03	2,38	0,00	0,91	0.17	99,73
8	J-8	64,44	0,81	16,08	1,83	1,88	0,07	3,52	2,14	4,89	2,55	0,00	1,83	0.14	99,86
9	J-9	65,47	0,82	15,16	1,87	2,59	0,05	3,30	1,48	4,12	1,86	–	2.76	0.13	99,61
10	J-10	67,64	0,81	13,89	1,51	3,13	0,05	3,64	1,59	3,09	2,43	–	1,66	0.11	99,55
11	J-11	68,79	0,49	15,51	1,58	1,67	0,05	2,78	1,04	4,70	1,75	–	1,32	0.15	99,83
12	V-15	72,50	0,45	13,62	1,40	0,81	0,04	1,79	0,70	3,54	3,88	0,13	0,99	0.11	99,96

Continuation to Tab. 3

13	V-16	74,32	0,15	13,69	0,45	0,32	0,02	0,97	0,35	3,54	4,72	0,11	0,66	0,57	99.87
14	V-17	72,74	0,38	15,00	1,05	1,10	0,09	0,89	1,15	2,84	4,25	—	1,06	0.06	100,61
15	V-18	67,20	0,70	15,45	2,32	1,65	0,03	2,62	1,32	3,84	3,16	0,24	1,19	0.03	99,75
16	J-12	72,34	0,22	14,69	1,30	0,62	0,02	1,68	0,42	4,26	3,55	—	0,78	0.11	99,99
17	J-13	67,86	0,54	14,37	1,61	1,29	0,04	2,65	1,15	5,83	3,58	—	0,89	0.10	99,91
18	J-14	71,01	0,17	12,91	1,12	0,59	0,03	0,93	0,68	8,21	2,81	—	1,21	0.07	99,74
19	J-15	71,89	0,06	13,38	1,33	0,28	0,01	0,55	0,28	6,43	5,14	—	0.49	0,14	99,98
20	J-17	55,41	0,93	15,81	3,58	3,40	0,08	4,93	5,52	6,32	1,87	—	1,64	0.15	99,64
21	J-18	64,13	0,56	15,37	0,78	2,03	0,06	2,87	2,27	7,13	3,37	—	1,00	0.18	99,75
22	J-19	70,27	0,27	14,58	0,91	1,02	0,03	1,61	0,68	4,79	4,71	—	0,67	0,14	99,68
23	J-44	71,80	0,32	14,06	1,12	1,23	0,04	1,45	0,97	4,30	3,40	—	1,04	0,15	99,88
24	V-19	67,94	1,02	14,17	1,84	0,99	0,06	1,98	1,45	3,96	5,16	0,31	0,86	0,12	100,02
25	V-20	70,49	0,36	14,66	0,81	1,50	0,04	1,32	0,92	3,73	4,80	—	1,11	0,06	99,80
26	J-46	67,40	0,56	15,94	1,34	1,90	0,04	2,34	1,56	3,59	3,83	—	1,11	0,14	99,75
27	J-47	74,35	0,26	14,87	0,77	1,07	0,03	1,06	0,77	3,83	1,89	—	0,84	0,10	99,84
28	J-20	71,45	0,30	14,73	0,76	1,17	0,07	1,70	0,75	5,51	2,21	—	1,01	0,18	99,84

No	Sample	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	$^{+}H_2O$	$^{-}H_2O$	Sum.
29	J-5	73,58	0,25	14,13	1,01	0,84	0,03	1,28	0,63	4,90	2,07	—	1,04	0.12	99,88
30	J-21	68,14	0,62	14,77	0,65	2,53	0,05	2,87	1,56	4,77	2,99	—	0,59	0.11	99,65
31	J-41	68,93	0,51	15,08	1,19	1,60	0,06	2,36	1,30	4,26	2,91	—	1,38	0,13	99,71
32	J-51	70,43	0,39	15,12	0,47	1,81	0,04	2,21	0,84	3,81	3,86	—	0,61	0.15	99,74
33	J-54	53,27	1,32	16,22	0,78	5,24	0,10	8,23	7,12	3,79	2,05	—	1,05	0,23	99,40
34	V-23	73,29	0,12	12,56	1,70	0,99	0,09	2,14	1,54	2,56	4,57	—	0,57	0,05	100,18
35	V-24	52,83	1,08	14,16	1,89	6,76	0,02	9,45	9,74	1,32	1,13	—	1,43	0.07	99,88
36	V-25	73,45	0,49	13,00	1,88	0,67	0,04	1,42	0,56	3,40	3,80	—	0,98	0.11	99,88
37	V-26	72,98	0,57	12,11	1,92	1,72	0,05	1,79	0,94	3,88	2,46	0,08	0,87	0.09	99,59
38	V-27	74,20	0,19	12,91	0,83	0,30	0,03	1,12	0,40	2,88	5,76	0,25	0,53	0.25	99.51
39	J-38	70,38	0,36	15,66	0,24	1,62	0,05	2,03	0,70	3,97	4,20	0,11	0.53	0,11	99,85
40	J-39	55,31	0,69	12,31	0,12	8,20	0,14	7,45	9,66	1,23	2,49	—	1,86	0.16	99.62
41	J-40	69,65	0,31	15,71	0,61	0,79	0,02	2,55	0,78	4,60	4,08	—	0,66	0,13	99,89

Explanations: see table 1
Samples marked V were analyzed by Ing. K. Dubíková, Katedra petrografie UK Bratislava
Samples marked J were analyzed by M. Vondrovic, Geol. ústav SAV Bratislava. They derive from the work of V. Vilinovič, 1978.
Samples marked S-1, S-2, Ve-1, Ve-2 derive from the work of B. Cambel et al., 1961.

Table 4

Chemical analyses of granitoid rocks beyond the profile

No	Sample	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	Na_2O	K_2O	P_2O_5	$^{+}H_2O$	$^{-}H_2O$	Sum.
1	J-22	69,70	0,42	14,56	1,00	0,97	0,04	1,79	1,02	5,48	3,73	—	0,94	0,15	99,80
2	J-23	74,64	0,11	13,64	1,29	0,30	0,02	0,51	0.31	3,57	4,92	—	0,57	0,10	99,98
3	J-24	71,66	0,40	13,33	0,89	1,41	0,05	2,08	1,16	4,66	2,78	—	1,24	0,19	99,85
4	J-25	65,62	0,62	15,51	1,45	1,80	0,07	2,98	1,55	6,01	2,70	—	1,29	0,17	99,77
5	S-1	65,60	0,42	17,06	1,65	2,04	0,08	5,21	3,12	2,45	1,64	0,46	0,72	0,05	100,50
6	S-2	64,89	0,40	17,09	0,94	3,04	0,12	5,42	2,36	2,92	1,85	0,46	0.84	0,09	100,42
7	Ve-1	70,88	0,29	14,22	0,89	1,37	0,06	2,21	0,91	4,00	5,00	0,27	0,71	0,03	100,84
8	Ve-2	72,13	0,35	13,90	0,89	1,64	0,05	2,19	2,15	2,91	3,67	0,02	0,65	0,02	100,57

Explanations to table 1, 2, 3, 4

V-10 biotite trondhjemite, valley Kamenistá 200 m E of the el. point 788,4
V-11 biotite trondhjemite, velley Kamenistá, 150 m E of sample V-10
V-12 leukogranite, valley Kamenistá, 300 m SE of the forest keeper's hut Klementka
V-13 biotite trondhjemite, village Sihla, small quarry, 40 m S of the road
V-14 biotite granodiorite, Tlstý Javor in the state road cut
J- 6 biotite tonalite, valley Kamenistá, cca 200 m E of the el. point 788,4
J- 7 biotite tonalite, valley Kamenistá, 150 m E of sample V-10
J- 8 biotite tonalite, valley Kamenistá, 350 m NE of sample V-11
J- 9 biotite trondhjemite, valley Kamenistá appr. 300 m W of the el. point 831,5
J-10 biotite tonalite, valley Kamenistá, 200 m E of the el. point 831,5
J-11 biotite trondhjemite, valley Kamenistá, 300 m E of sample J-10
V-15 granodiorite, N of Drábsko, state road cut appr. 450 m SE of the el. point 932,3
V-16 granite, 550 m SE of sample V-15
V-17 muscovite melangranitoid rich in quartz, old road to Lom nad Rimavicou, 300 m SW from the el. point 768,4
V-18 biotite granodiorite, valley of Rimavica, appr. 175 m NE of the el. point 702,5
J-12 muscovite granite, N of Drábsko, cut of the new road 100 m SE of the el. point 932,3
J-13 biotite granodiorite, 450 m SE of the el. point 932,3
J-14 muscovite granite, 250 m SW of sample V-16
J-15 leukogranite, appr. 150 m SE of sample J-13
J-17 biotite leukoquartzy diorite, Uhliarka, 50 m E of the el. point 741,2
J-18 biotite granodiorite, village Plešková, appr. 450 m SW of the el. point 821,2
J-19 granite, village Plešková, 800 m NW of the el. point 643,4
J-44 muscovite — biotite granodiorite, Ďurkovka, appr. 550 m W of the road cut
V-19 biotite granite, valley Rimavica, 250 m SE of the forest keeper's hut Ďurkovka
V-20 biotite granite, Hrbok, appr. 550 m S in the road cut to Utekáč
J-46 biotite granodiorite, Hŕbok, in the road cut appr. 200 m SE of the el. point 564,3
J-47 leukogranodiorite, pod Beračkou, in the road cut SSW of the el. point 517,3
J-20 biotite granite, Plešková — Dlhá Lúka, in the forest road cut, near the el. point 643,4
J- 5 biotite granodiorite, valley Kamenistá, 500 m NW of the el. point 788,4
J-21 biotite tonalite, Plešková — Dlhá Lúka, in the forest road cut 250 m SSW of the el. point 643,4
J-41 biotite — muscovite melagranite, Dlhá Lúka, 60 m SE of the el. point 621,3
J-51 biotite granite, NW border of Utekáč, exposure at the slope near the road
J-54 biotite — hornblende melaquartz diorite, Dlhá Lúka — Durkovka, appr. 450 m NE of the el. point 621,3
V-23 biotite granite, quarry near the road between Zlatno and České Brezovo
V-24 hornblende melatonalite, quarry appr. 300 m N of České Brezovo
V-25 biotite granodiorite, quarry appr. 300 m N of České Brezovo
V-26 biotite granodiorite, quarry 250 m N of České Brezovo
V-27 biotite granite, quarry 250 m N of České Brezovo
J-38 muscovite granitoid rich in quartz, quarry near the road between Zlatno and České Brezovo
J-39 biotite hornblende melatonalite, second quarry appr. 300 m N of České Brezovo
J-40 biotite diorite, second quarry appr. 300 m N of České Brezovo

J-22 biotite granodiorite, region Samoterč, cut of the new road appr. 60 m N of the el. point 780,5
J-23 leukogranite, village Podrovinka, cut in the forest road 500 m SW of the el. point 877,3
J-40 and J-54.
J-24 biotite granodiorite, village Podrovinka, 500 m SW of the el. point 877,3

J-25 biotite trondhjemite, village Podrovinka, exposure in the forest, 80 m SW of the el. point 837,4
S-1 biotite granodiorite, road cut near the el point 1020,2 Tlstý Javor
S-2 as sample S-1
Ve-1 porphyry biotite granite, quarry 2 km S from the village Dobroč
Ve-2 as sample Ve-1

Table 5

Average chemical analyses of the studied granitoid rock types

Oxids	Granite	Granodiorite	Tonalite	Quartzdiorite
SiO_2	72,04	70,37	67,75	54,34
TiO_2	0,28	0,51	0,72	1,13
Al_2O_3	14,17	14,21	15,09	16,02
Fe_2O_3	1,01	1,46	1,64	2,18
FeO	0,86	1,30	1,93	4,32
MnO	0,04	0,04	0,05	0,09
MgO	0,71	1,12	1,58	6,32
CaO	1,33	2,04	3,09	6,58
Na_2O	4,23	4,48	4,18	5,06
K_2O	4,24	3,12	2,47	1,96
P_2O_5	—	—	—	—
H_2O^+	0,80	0,99	1,31	1,35
H_2O^-	0,15	0,11	0,13	0,19
Number of analyses	19	13	13	2

Explanations to table 5

To average chemical analyses of granites belong the samples V-12, V-16, V-16a, V-19, V-20, V-23, V-27, J-12, J-15, J-14, J-19, J-20, J-23, J-41, J-45, J-47b, J-50, J-51, J-32.

The average chemical analysis of granodiorite was calculated from the samples V-14, V-15, V-18, V-25, V-26 and J-5, J-13, J-18, J-22, J-24, J-44, J-46, J-47a.

The average chemical analysis of tonalite was calculated from the chemical analyses of samples V-10, V-11, V-13 and J-6, J-7, J-8, J-9, J-10, J-11, J-21, J-24.

The average chemical analysis for quartzdiorites was calculated from samples V-14, V-15, V-18, V-25, V-26, and J-5, J-13, J-18, J-22, J-24, J-44, J46, J-47a.

with white "porphyric" feldspars, designated also as Vepor type vary by mineral constitution in the range from quartzdiorite up to granites.

Also porphyric granites to granodiorites with pink porphyry feldspars designated in work as Ipeľ type, fall by their mineral composition in the field of granodiorite up to granite.

The broad variation in mineral composition points already to the fact that granitoid rocks are concerned which were generated from a magmatic melt, whose origin should be searched for in anatexis and palingenesis. This fact is reflected also in the diagram Q—Ab—Or.

Planimetric analyses are given in table 1 and 2. Planimetric analyses derive of the work of D. Mudrák (1978) and. V. Vilinovič 1978).

Petrochemistry

49 chemical analyses were performed for the petrochemical study of the rocks from the granitoid body, from which general valid conclusions may be drawn. (Tab. 3 and 4).

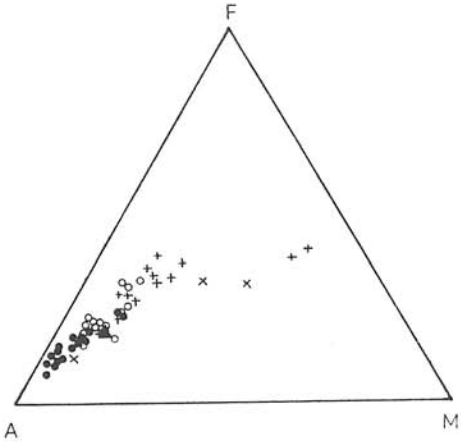

Fig. 7. A—F—M diagram of the differentiation process of granitoid rocks from the studied area of the Veporide massif. *Explanations:* see Fig. 2.

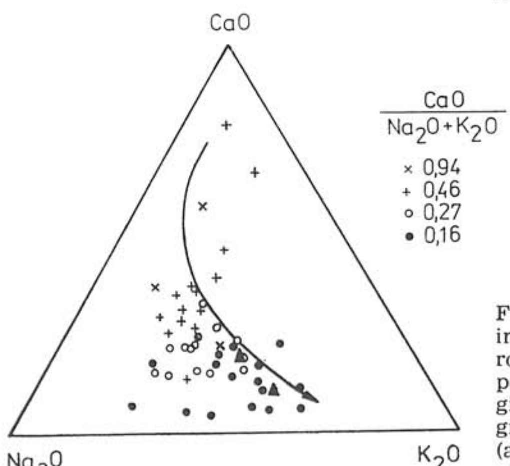

Fig. 8. Threecomponent diagram revealing the differentiation trend of granitoid rocks in the investigated area of the Veporide massif. At right the values are given of the ratio for average types of granitoides in the area investigated (according to J. Green and A. Poldervaart, 1958). *Explanations:* see Fig. 2.

In view of present results of petrochemical investigations it is evident, that granitoid rocks of the major Veporide body represent most probably "granitoids" of anatectic to palingenous character, as this follows from Q–Ab–Or triangle (Fig. 3), where their projection points fall prevalently into the field of anatexis delimited by H. G. F. Winkler 1974). The same relation may be found also in the diagram Al_2O_3 - (2 $CaO + Na_2O + K_2O$) and $\frac{FeO + Fe_2O_3}{FeO + Fe_2O_3 + MgO}$ (Fig. 4), where the projection points of the investigated granitoid rocks are situated in the field of palingenous and anatectic granites. These preliminary conclusions are consistent also with the results of the study of B. Cambel et al. (1977), at the basis of a constructed isochron Pb (Fig. 5). In this figure we see the isotope ratios of lead for granitoid rocks of the southwestern part of the Veporide crystalline complex, and this points to their palingenous origin.

Correlation diagrams (Fig. 6) of the dependence of individual oxids by the degree of acidity - of the Larsen coefficient (J. Klominský, 1969) characterize the mode of magna differentiation, regardless of the origin of the magna. The Veporide granitoids may be characterized by increase of SiO_2 and K_2O, thus by normal trend of differentiation. This is evident also from average chemical working analyses of granitoid rocks investigated in the profile Hrončok – Kokava nad Rimavicou (see table 5).

The triangle AFM (Fig. 7) indicates that granitoids belong to the alkaline and alkaline – calcic association, as it follows from the triangle Na_2O – CaO – K_2O (Fig. 8) and follow the alkaline – calcic differentitation trend established by J. Green – A. Poldervaart (1958).

Translated by L. Mináriková

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