Acta Mineralogica-Petrographica, Szeged, XXXV, 95–109, 1994

PETROGRAPHICAL CHARACTERISTICS OF DITRÓ (OROTVA) DIORITES, EASTERN CARPATHIANS, TRANSYLVANIA (ROMANIA)

E. PÁL MOLNÁR*

Department of Mineralogy, Geochemistry and Petrography, Attila József University

ABSTRACT

One of the most important rock groups outcropping in the NW part of the Ditró syenite massif, north of the Orotva creek and between the Csibi Jakab and Tászok creeks is the group of the dioritic rocks. On the basis of the mineralogical composition, color index (M) and the textural characteristics, this rock group can be divided into the following rock types: (1) meladiorites:meladiorites with textural ordering, meladiorites without textural ordering, schistose meladiorites; (2) normal diorites: diorites with textural ordering, diorites without textural ordering, feldspar schlieren diorites,diorites with feldspar aggregates; (3) leucodiorites: leucodiorites with textural ordering, leucodiorites without textural ordering.

As the 1:5000 geological map of the area shows, these diorites do not form layer like and lenticular bodies (as some researchers have suggested), but they are irregular rock bodies showing gradual transition and joggle toward the neighboring rocks. Diorites represent a connection between the hornblendites and the metamorphic rocks as well as between the syenites, monzonites and granites. To form this tectonic setting two (spatially equivalent but temporally different) magmatic mass had to be intruded.

INTRODUCTION

The syenite massif of Ditró (46°48′ N, 25° 30′ E) is situated in the S-SW part of the Gyergyó Alps belonging to the Eastern Carpathians. Diameter of its surface are 19 km and 14 km in NW and SE directions, respectively; its area is 225 km^2 including the bordering zones as well (*Fig. 1*).

In the NW part of the syenite massif, north of the Orotva creek and between the Csibi Jakab and Tászok creeks (*Fig. 1*) natural and artificial exposures, mines and drillings made an accurate geological mapping possible. The approximately 6 km^2 area between a major fault along the Orotva creek and the massif as well as the contact of the neighboring metamorphic rocks was mapped. Base of the 1:5000 geological map (*Fig. 2*) was a geological map made by ZÓLYA in 1986, which partly touches the area. During the field work, beside the accurate representation of the petrographical and tectonic conditions of the area, ultrabasic and intermediate rocks were studied in particular because I believe that genetics and petrogenetical classification of these rocks can bring genetics of the whole massif to light (PÁL MOLNÁR 1992).

In the mapped area, CODARCEA *et al.* (1957) divided the rocks outcropping in the Orotva valley from the west to the east into four rock complexes: (1) Complex of the Diorite-hornblendite Rocks; (2) Complex of the Syenitoid Rocks; (3) Complex of the Granitoid Rocks; and (4) Complex of the Dike-rocks. In their opinion, rock on the

* H–6701 Szeged, P.O. Box 651, Hungary

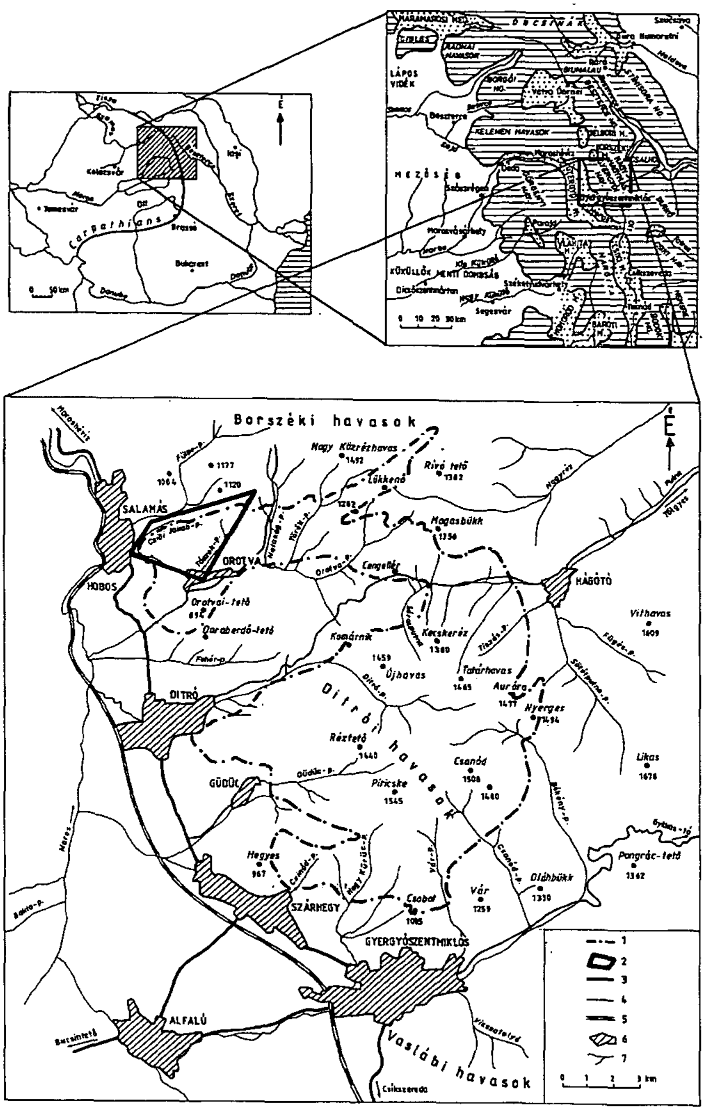

Fig. 1. Geographic environment of the Gyergyó Alps (Transylvania, Romania)
1. Boundary line of the Ditró Syenite Massif; 2. Study area; 3. Modernized road; 4. Non-modernized road; 5. Railway; 6. Settlement (town); 7. River (creek)

surface is a migmatic overlying of a plutonic anatectic diapir. On the basis of the rock associations, ANASTASIU *et al.* (1979) divided the massif into two sectors: (I) Orotva-Putna Sector (northern part of the massif) and (II) Ditró valley-Güdüc-Békény Sector (central and southern part of the massif). Rocks of the Ditró valley-Güdüc-Békény Sector are divided into five rock complexes: (1) Complex of Ultramafic and Mafic Rocks; (2) Complex of Diorites; (3) Complex of Monzonites and Syenites; (4) Com-

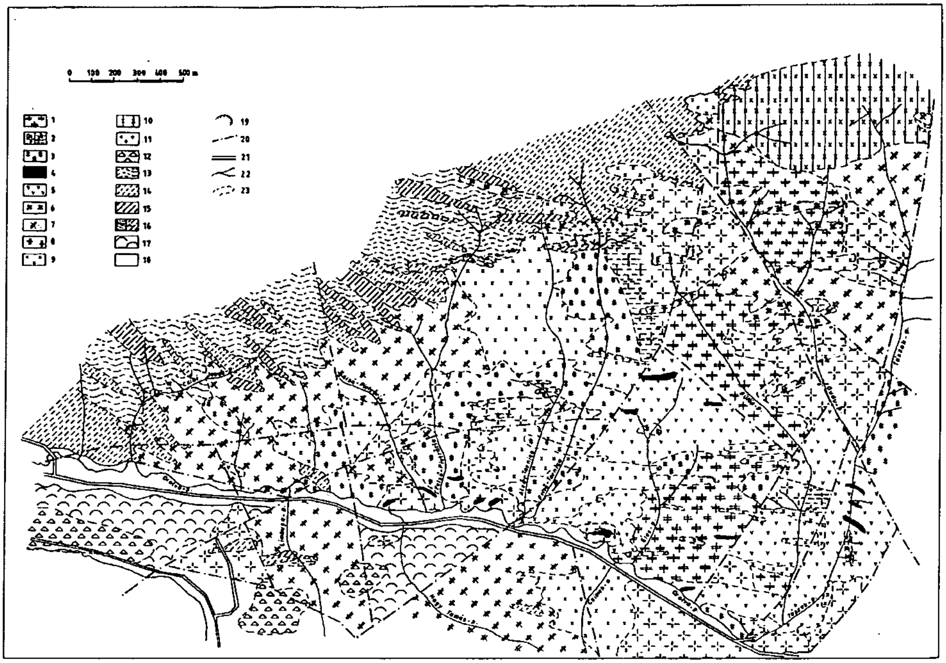

Fig. 2.
Geological map of the area of the northern part of the Ditró Syenite Massif between Csibi Jakab and Tászok creeks (PÁL MOLNÁR, ZÓLYA, 1988)
1. Meladiorite; 2a. Diorite without textural ordering; 2b. Diorite with textural ordering; 3. Hornblendite; 4. Biotitite; 5. Monzonite; 6. Alkali feldspar microsyenite; 8. Quartz syenite; 9. Syenite; 10. Nepheline syenite; 11. Granite; 12. Volcanic agglomerates; 13. Black quartzite; 14. Crystalline schists; 15. Mesometamorphites; 16. Hornfels; 17. Deluvial and coluvial sediments; 18. Alluvium; 19. Opened mine; 20. Fault; 21. Non-modernized road; 22. Creek; 23. Boundary of rocks

plex of Granitoids; (5) Complex of Foiditoidic Rocks. In their opinion, multiphase, multistage magmatic intrusions formed these rocks

Most researchers arranged hornblendites and meladiorites among the Complex of Ultramafic and Mafic rocks (ANASTASIU *et al.* 1979, ZÓLYA *et al.* 1985, ZÓLYA 1986; PÁL MOLNÁR 1988). On the basis of the IUGS standars (LE MAITRE 1989) only the hornblendites can be classified as ultramafic rocks (PÁL MOLNÁR 1992). Consequently, meladiorites should be petrografically arranged among the diorites.

Aim of this paper is tectonic and mineralogical-petrographical characterization of the diorite group.

PETROGRAPHICAL CHARACTERISTICS OF DIORITE GROUP

Diorites outcropping north of the Orotva creek and between the Csibi Jakab and Tászok creeks have a great tectonic variety. Hence, judgement of their petrography changed from time to time.

Diorites with ordering textures outcropping near the lower section of the Fülöp and Tászok creeks were arranged into essexites by IANOVICI (1933). In his opinion, texture of the rock represents schistose-fluidal transition. Approximately 70% of the minerals are ordered, the color index (M) is about 50%. CODARCEA *et al.* (1957) suggest that diorites represent the dominant part of the Complex of Diorite-hornblendite Rocks. STRECKEISEN *et al.* (1974) emphasize that there are two dioritic complexes in the Ditró syenite massif: one is in the lower section of the Orotva valley, and another is in the zone of the Cengellér-Güdüc creek. Rocks of the last complex differ from the normal diorites in their essexitic chemical character. STRECKEISEN classified these rocks, together with monzodiorites, nepheline diorites and nepheline monzodiorites, as ditró-essexites. In opinion of ANASTASIU *et al.* (1979), dioritic rocks of Orotva from stratiform rock bodies, lens, schlierens, nests, and show great textural variety (pegmatoidic, normal and micrograined, ordered and non-ordered textures). The authors emphasize that the hornblendite-diorite transition is gradualy formed by the quantitative increase of plagioclase and the quantitative decrease of amphibole. On the basis of the color index (M), they described the following rock types: leucodiorites (M<25%), diorites (M=25-50%). ZINCENCO *et al.* (1978) suppose diorite complex of Orotva to be "ring" rocks because of the ordered texture of the most rocks.

On the basis of my field work and field experience, I suppose that diorites do not form stratiform bodies and lens. They are tectonically absolutely irregular bodies (*Fig. 2*), and show gradual transition and joggle toward the adjacent rocks. There cannot be found any definite spatial sequence (e.g., hornblendite → meladiorite → diorite → monzodiorete etc.) supposed by CODARCEA *et al.* (1957), and ring structure of various rock complexes suggested by ZINCENCO *et al.* (1978) cannot be showed, either. Shape of the diorite bodies is irregular, and their spatial arrangement is absolutely chaotic. Diorites can have a contact with any other rock type of the massif (PÁL MOLNÁR 1988), but generally occur near the hornblendites, surrounding them, and forming gradual transition or joggle. Direct contacts with the neighboring metamorphic rocks, however, are rare.

On the basis of the mineralogical composition, color index (M), and textural features, rocks of the dioritic group can be classified as follows:

- meladiorites with textural ordering
- meladiorites without textural ordering
- schistose meladiorites
- diorites with textural ordering
- diorites without textural ordering
- diorites with feldspar "schlieren"
- diorites with feldpsar aggregates
- leucodiorites with textural ordering
- leucodiorites withot textural ordering.

PETROGRAPHICAL DESCRITPION OF MELADIORITES

In general, meladiorites have close spatial connection with hornblendites. Beside the mineralogical composition, the textural difference of the rocks is the most characteristic. Most of the meladiorites has ordered texture. Reason of the ordering can be explained by several hypotheses: solidification of the rocks under high pressure (IANOVICI 1933), transformation of crystalline rocks by anatectic processes preserving the original schistose texture (CODARCEA *et al.* 1957), Fe-Mg metasomatosis of the crystalline rocks preserving the original schistose texture (JAKAB 1986). In general, the two rocks types have transitional contacts but direct contacts between meladiorites with ordered texture and hornblendites without ordered texture also occur.

1. Meladiorites with ordered texture

On the basis of the shape of the minerals, texture of the rock represents a transition between the hypidiomorphic and the allotriomorphic types. The ordered texture is due to the striped arrangement of the melanocratic minerals and the lathshaped plagioclase crystals (*Fig. 3.*).

Modal composition of the rock is shown by Table 1 and *Fig. 4.*

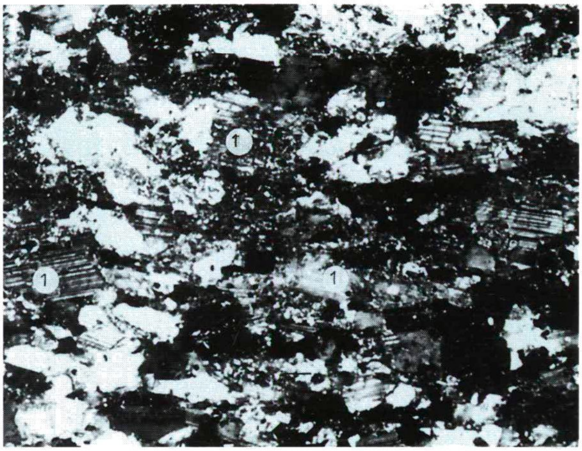

Fig. 3. Meladiorite with textural ordering
Striped arrangement of plagioclase crystals (x23; +N)

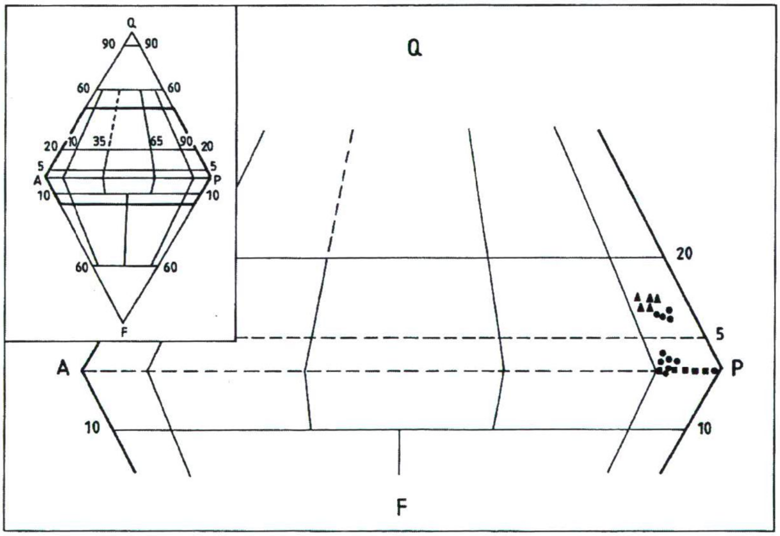

Fig. 4. Classification of plutonic rocks based on their mineral composition (LE MAITRE, 1989)
(•) meladiorites with textural ordering; (Δ) schistose meladiorites; (■) diorites with textural ordering

TABLE 1

Modal composition of the diorites

Minerals	Volume %			
	1	2	3	4
Aktinolite	0–13	–	–	–
Albite An_{0-5}	3–6	1–2	–	–
Apatite	2–6	4–6	4–5	–
Biotite	1–27	–	10–30	2–3
Carbonate	2–3	–	2–3	1–2
Chlorite	0–3	–	1–2	1–2
Hornblende	28–57	–	20–22	28–29
Plagioclase $An_{>5}$	9–44	14–18	38–60	54–55
Pyroxene	0–4	–	7–8	–
Orthoclase + Microcline	0–5	–	4–6	–
Epidote	0–3	–	3–6	–
Sericite	1–4	–	1–2	4–5
Quartz	4–6	2–3	–	5–6
Sphene	4–28	2–3	6–7	–
Magnetite	0–4	2–3	2–3	5–6
Chlorit + Secondary generation sphene + Calcite + Epidote + Biotite	–	70–80	–	–

(1) meladiorite with textural ordering, (2) schistose meladiorite, (3) diorite with textural ordering, (4) diorites with feldspar aggregates

Feldspars fill the space among the melanocratic minerals. Most of them are plagioclase, quantity of the alkali feldspars (microcline, orthoclase, perthite) is very low. Anorthite content of the plagioclase is 12–58% (CONSTANTINESCU and ANASTASIU 1977) but albite also occurs possibly as a secondary mineral. The feldspar crystals are very often sericitized, epizotized. Most of the feldspar crystals contain poikilitically idiomorphic apatite (*Fig. 5*).

Among the melanocratic minerals the long, prismatic hornblende is the most frequent one. It shows light brown-dark brownish green or light brown-dark brown pleochroism. Close intergrowth between hornblende and biotite can be found very often. The larger crystals are dented due to the actinolization. They contain poikilitically idiomorphic apatite and calcite (*Fig. 6*).

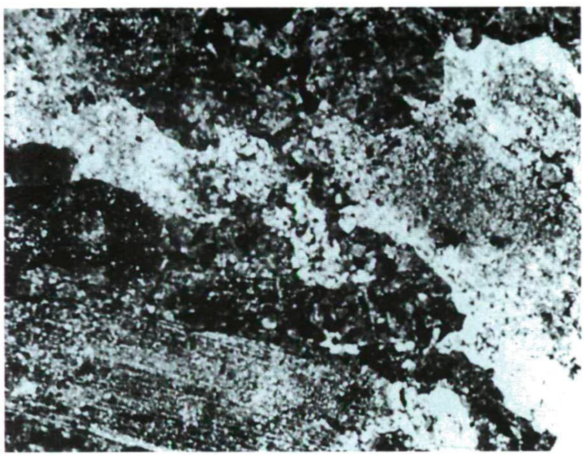

Fig. 5. Meladiorite with textural ordering
Sericitized, epidotized feldspar with apatite inclusion (x23; +N)

Fig. 6. Meladiorite with textural ordering
Hornblende(3) with apatite(1) and calcite(2) inclusions (x23; +N)

Very rarely, partly amphibolized pyroxene also occurs in the rock.

Biotite occurs as well-developed plates. The larger plates often have chlorite bands, and in some cases, are epidotized. Carbonate nests can be found among the plates, as well. Formation of the secondary sphene is also related to the larger biotite plates (*Fig. 7*).

The well-developed idiomorphic crystals of apatite can be found in all other minerals (even in the sphene crystals). Because of the rapid crystal growth, accumulation of the apatite crystals can be observed in the margins of the sphene ones.

The rare twinned sphene crystals are well-developed in every case (*Fig. 8*).

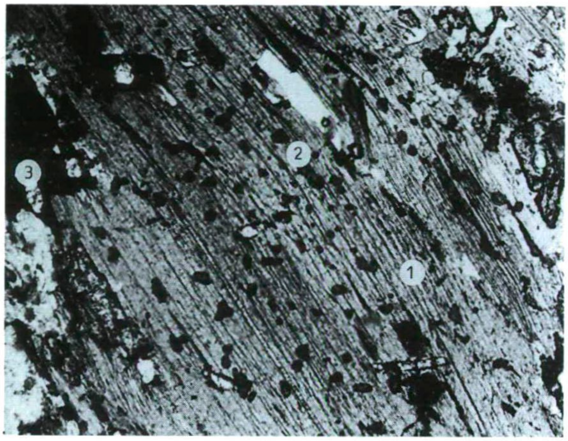

Fig. 7: Meladiorite with textural ordering
1. biotite; 2. secondary sphene; 3. apatite (x50; +N)

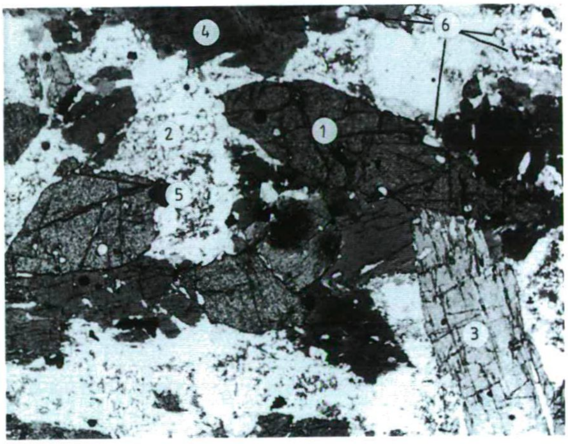

Fig. 8: Meladiorite with textural ordering
1. sphene; 2. feldspar; 3. biotite; 4. hornblende; 5. magnetite; 6. apatite (x23; 1N)

2. Meladiorites without textural ordering

Mineralogical composition of these rocks is the same as that of meladiorites with textural ordering. The only one difference is between their texture (*Fig. 9*). The amphibole and feldspar crystals have not oriented arrangement.

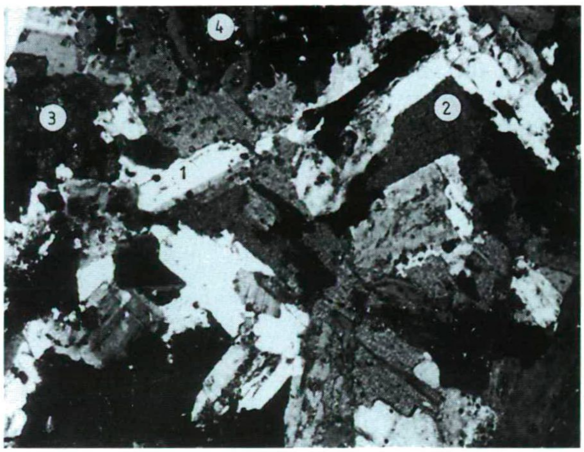

Fig. 9: Meladiorite with textural ordering
1. feldspar; 2. biotite; 3. sphene; 4. hornblende (x23; +N)

3. Schistose meladiorites

This rock type was first descibed as "laminated hornblenditic and gabbroid rocks" by CODARCEA *et al.* (1957). According to the authors, these rocks were formed by metamorphosis of hornblendites in the border zone of basic and ultrabasic rocks.

On the basis of the modal composition (Table 1), the rock should be named as meladiorite (*Fig. 4*). Microscopic texture of the rock is varying; on the basis of relative size of the minerals, it is porphyritic. The porphyritic texture is given by the rounded plagioclase crystals and the chlorite agglomerate containing xenomorphic megnetite inclusions. "Flow" appearance of this agglomerate provides the schistose character of the rock.

Melanocratic minerals (hornblende, biotite) are almost totally chloritized. Sphene, apatite and, rarely, nests and grains of quartz also occur. Parallel with the "laminating" planes, calcite grains can be observed.

Considering the frequent mechanical deformation of the minerals and massive appearance of the secondary constitutions (chlorite, carbonate), it is possible that these rocks are products of meladiorites that underwent tectonic movements. Appearance of calcite and quartz veins indicate non-metallifer hydrothermal solutions that circulated along the palaeofaults.

1. Diorites with textural ordering

Melanocratic minerals (mainly hornblende and/or biotite) form parallel bands. These parallel bands provide the ordered pattern of the texture (*Fig. 10*). Within the melanocratic bands, however, amphibole crystals are not parallel to the bands, and are arranged in divergent, radial or chaotic way.

Modal composition of the rock is ashown by Table 1. and *Fig. 4.*

Microscopic texture of the rock is hypidiomorphic. The most frequent leucocratic mineral is the plagioclase. The well-developed crystals are xenomorphic and trimmed (*Fig. 11*). The alkali feldspars (microcline, perthite) fill the space among the plagio-

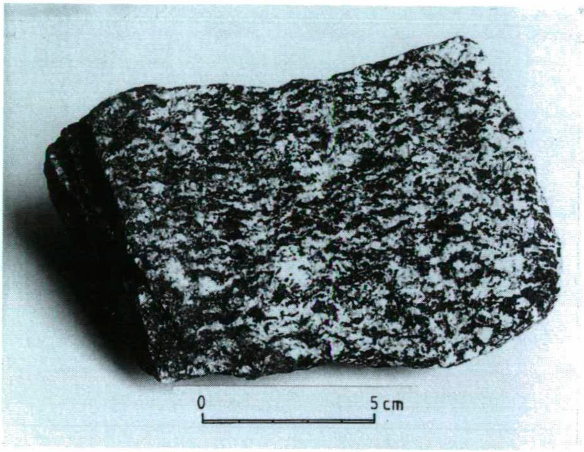

Fig. 10: Diorite with textural ordering

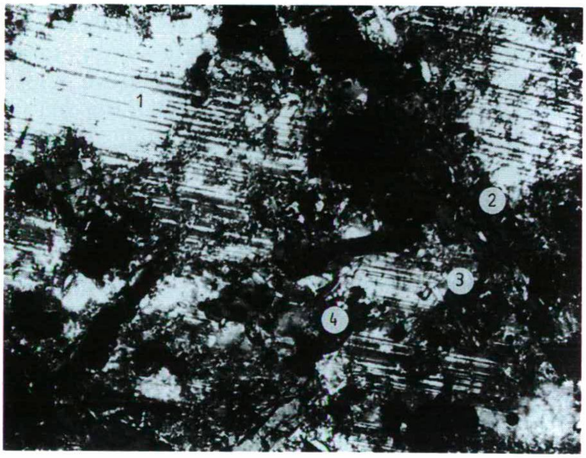

Fig. 11: Diorite with textural ordering
1. plagioclase; 2. biotite; 3. hornblende; 4. sphene (x23; +N)

clase crystals. Anorthite content of the plagioclase ranges from 10 to 45%, frequently 20–30% (JAKAB *et al.* 1987) that corresponds to oligoclase-andesine. It is frequent that cores of the crsytals are altered, sericite and apidote can be found as xenomorphic disperse grains. Chlorite veinlets can be observed in the fissures of the plagioclase crystals, as well.

Amphibole crystals of the rock are very similar to that of hornblendites (PÁL MOLNÁR 1992). The prismatic amphibole crystals have brownish-greenish pleochroism. They very often include sphene, rutile and apatite inclusions (*Fig. 12*). Rarely, the hornblende is chloritized, and in this way, the rock shows slightly greenish color. It is general that the hornblende is intergrown with the biotite.

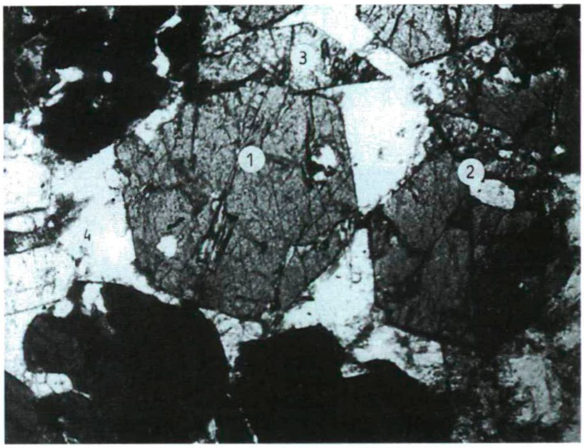

Fig. 12: Diorite with textural ordering
1. hornblende; 2. apatite; 3. sphene; 4. feldspar (x23; +N)

The prismatic, strongly fractured pyroxene crystals (diopside augite, Ti-augite, aegirine augite, augite) are quite rare in the rock.

The biotite has two variants. The well-developed lamellar one is chloritized on the edges of its crystals, has greenish-brownish pleochroism, and in some cases, has pyroxene desaggregate inclusions. The other variant occurs on the edges ot in cores of the amphibole crystals, and it frequently has apatite inclusions (*Fig. 13*). Epidotization also occurs on the marginal parts and along he cleavages of the biotite.

Accessory minerals of the rock are the same as that of hornblendites (PÁL MOLNÁR 1992). Sphene, apatite and opaque minerals (magnetite, titanomagnetite) are the accessory minerals of largest quantity (*Fig. 14*).

The most important secondary minerals formed by metamorphosis of the rock-forming ones are sericite, calcite, epidote and chlorite.

2. Diorite without textural ordering

Mineral composition of the these rocks is the same as that of diorites with textural ordering. The only one distinction criterion is the texture of the rock which is hypidiomorphic, phanerocrystalline, and has not textural oredring (*Fig. 15*). The grains-size ranges from 1.0 to 5.9 mm; in some cases, the rock is pegmatitic and microcrystalline.

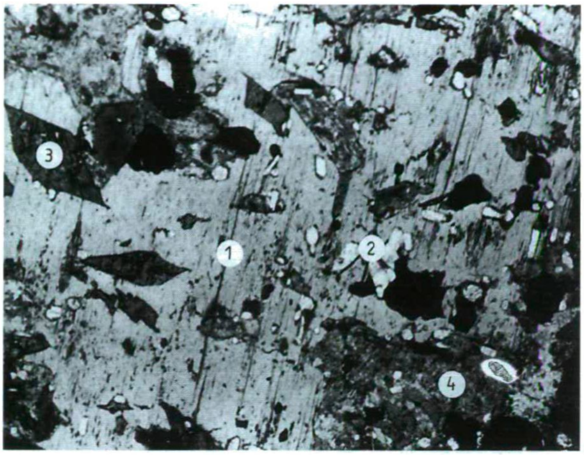

Fig. 13:
Diorite with textural ordering
1. biotite sericitized on the edges including apatite (2), sphene (3) and chlorite (4) inclusions (x50; 1N)

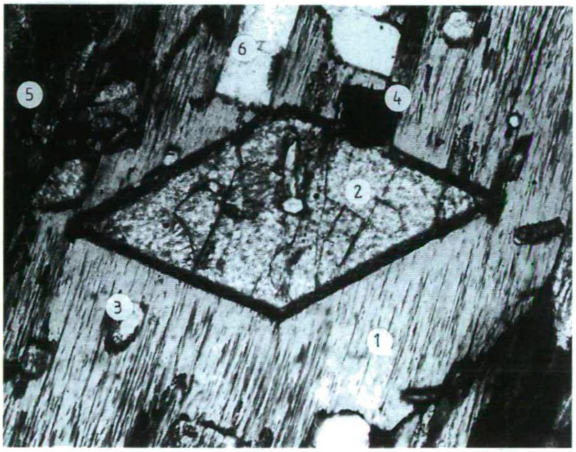

Fig. 14:
Diorite with textural ordering
1. biotite; 2. sphene; 3. apatite; 4. magnetite; 5. chlorite; 6. feldspar (x50; 1N)

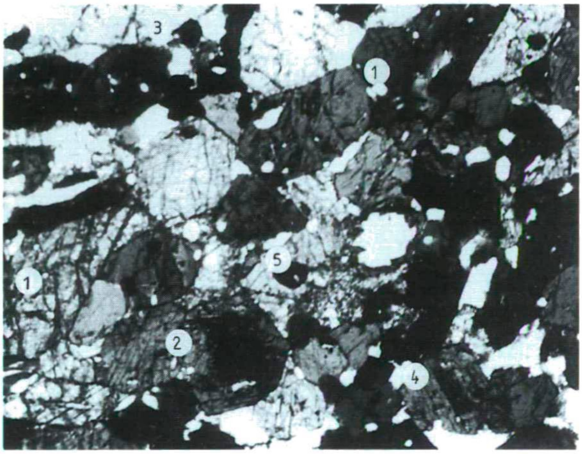

Fig. 15:
Diorite without textural ordering
1. sphene; 2. hornblende; 3. feldspar; 4. biotite; 5. magnetite (x23; 1N)

3. Diorites with feldspar "schlieren"

It is very frequent that the larger prismatic crystals of plagioclase are associated with the smaller isometric plagioclase ones. The smaller ones are weathered and, in general, occur in the melanocratic bands. Some smaller plagioclase crystals can be found in the larger ones. This observation suggests that the larger plagioclase crystals are the younger. Crystals of the plagioclase are parellel with together and with the melanocratic minerals, and in this way, determine the ordered arrangement of the texture.

4. Diorites with feldspar aggregates

There are plagioclase aggregates (cumulates) with diameter of 2–3 cm in the rock (*Fig. 16*). In these augens, hornblende of small size, small planes of biotite and, sometime, idiomorphic sphene crystals occur in form of continuous strings or in isolated grains. Melanocratic minerals of the feldspar augen are parallel to each other is every case. In most cases, their orientation corresponds to the textural ordering of the rock. It suggests that plagioclase crystals formed subsequently in such a way that they did not disturb the original orientation of the melanocratic minerals.

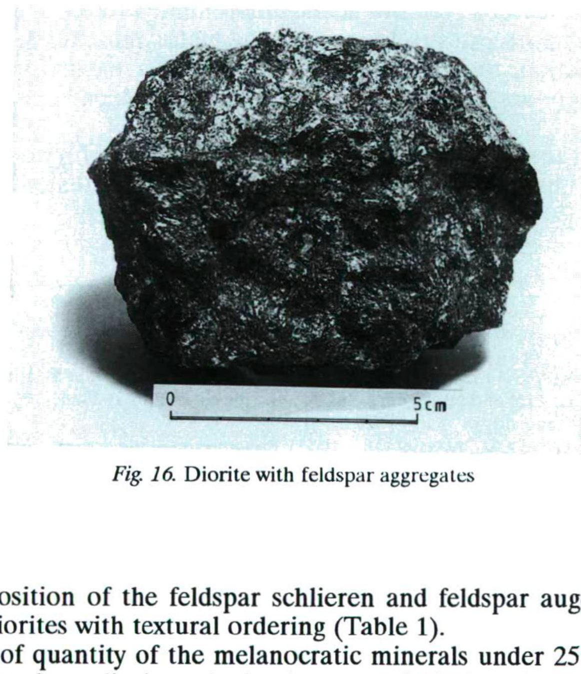

Fig. 16. Diorite with feldspar aggregates

Mineral composition of the feldspar schlieren and feldspar augen diorites is the same as that of diorites with textural ordering (Table 1).

By a decrease of quantity of the melanocratic minerals under 25%, diorites might gradually turn into leucodiorites. As in the case of diorites, leucodiorites with and without textural ordering can also be distinguished. Mineralogical parameters of leucodiorites are the same as that of diorites.

CONCLUSIONS

The above presented very detailed classification for rocks of the diorite group, which is based on their mineralogical compositions and textural characters, is the first one in the literature in such form.

From the geological map of the northern part of the Ditró syenite massif it emerges that diorites do not form layerlike or lenticular bodies. There are irregular rock bodies that have gradually transition and joggle toward the neighboring rocks. Diorites have always contact with hornblendites, and, beside rocks of the syenite group, they may have contact with metamorphic rocks, too. Consequently, diorites represent a connection of a certain kind between hornblendites and metamorphic rocks as well as between syenites, monzonites and granites. I suppose that two (spatially equivalent but temporally different) magmatic mass had to be intruded to form this tectonic setting. Because mineral composition of rocks of diorite group outcropping on the area between Csibi Jakab and Tászok creek and that of hornblendites, which are in contact with them, are very similar (PÁL MOLNÁR 1992), the mineralogical relationshp of these two groups is evident. It is possible that a subcrustal uktrabasic parental magma (hornblendites) was hybridized (creating the diorites) and taken toward the surface by a less siliceous megma. Naturally, the later magmatic intrusion, which is partly equivalent with the parental magma in space, assimilated the neighboring quartz-rich metamorphic rocks, and resulted in a series of acidic differentiated rocks.

Orientation of agglomerates (schlieren) of the maffic minerals might be a result of an intrusive brecciation, too. Thermal effect of the later magma might re-crystallize hornblende: the melt was forced into fissures of the hornblende, and surrounded the broken parts.

I emphasize that these petrogenetic conclusions are based on field and mineralogical-petrographical observations. Very accurate geochemical analyses (trace elements, isotopes) are need for confirmation or rejection of this model.

REFERENCES

ANASTASIU, N., CONSTANTINESCU, E. (1979): Structura și petrogeneza masivului alcalin de la Ditrău, Raport geologic final. (Structure and petrogenesis of alcaline massif of Ditró). Doc. Dept. of IPEG "Harghita", Miercurea-Ciuc, Manuscript.

CODARCEA, AL., CODARCEA, D. M., IANOVICI, V. (1957): Structura geologică a masivului de roci alcaline de la Ditrău. (The geological structure of the Ditró Syenite Massif). Bul. St. RPR. Geol. Geofiz., **II/3–4)**, 385–446.

CONSTANTINESCU, E., ANASTASIU, N. (1977): Studiul mineralogic al Masivului alcalin de la Ditrău. (Mineralogical studies of alcaline massif of Ditró). Doc. Dept. IPEG "Harghita", Miercurea-Ciuc, Manuscript.

IANOVICI, V. (1933): Étude sur le massif syénitique de Ditrău, région Jolotca, district Ciuc (Transylvanie). Rev. Muzeului Geol. Min. Univ. Cluj, **4/2**, 1–53.

JAKAB, GY. (1986): O nouă variantă de interpretare genetică a masivului alcalin de la Ditrău, bazat pe rezultate obținute de forajele structurale. (A new genetical interpretationof the Ditró Syenite Massif on the results of structural drilling). Simp. Geol., Gheorgheni, Manuscript.

JAKAB, GY., Garbașevschi, N., BALLA, Z., ZAKARIÁS, L., PÉTER, J., STRUNGARU, T., HEREDEA, N., SILEANU, T., ARONESCU, M., POSTOLACHE, C., MOCANU, V., TEULEA, G., HANNICH, D., TIEPAC, I. (1987): Sinteza datelor obținute prin prospecțiuni geologice complexe, lucrări miniere și foraje, executate pentru minereuri de metale rare și disperse, feroease și neferoase în masivul de roci alcalina de la Ditrău, jud. Harghita. (Synthesis of informations from complex geological mapping, concerning especially the rare elements, ferrous and non ferrous minerals in the alcaline massif of Ditró, Hargita county). Doc. Dept. of IPEG "Harghita", Miercurea-Ciuc, Manuscript.

LE MAITRE, R. W. (1989): A Classification of Igneus Rocks and Glossary of Terms, Blackwell, Oxford.

PÁL MOLNÁR, E. (1988): Studiul mineralogic şi petrologic al complexului Jolotca din masivul alcalin de la Ditrău, cu privire specială asupra mineralelor purtătoare de fier. (Mineralogical and petrographical study of the Orotva Complex of the Ditró syenite massif, with special respect to the iron-bearing minerals with iron content). Lucr. dipl., Univ. Babeş-Bolyai, Cluj-Napoca, Manuscript.
PÁL MOLNÁR, E. (1992): Petrographical characteristic of Ditró (Orotva) hornblendites, Eastern Carpathians, Transylvania (Romania): a preliminary description. Acta Min. Petr., Szeged, **33**, 67–80.
STRECKEISEN, A., HUNZIKER, I. C. (1974): On the origin of the Nephelinsyenite Massif of Ditró (Transylvania, Romania). Schweiz. Min. Petr. Mitt., **54**, 59–77.
ZINCENCO, D., VLAD, C. (1978): Raport. Studiul geochimic-metalogenetic al masivului Ditrău şi al formaţiunilor adiacente cu privire specială asupra mineralizaţiilor asociate. Partea I. Structure, petrografia şi petrologia masivului. (Report. geochemical and metalogenic investigations on the massive of Ditró, concerning its ore. Structure, petrography and petrology of the massif. Part I.). Doc. Dept. of IPEG "Harghita", Miercurea-Ciuc, Manuscript.
ZÓLYA, L., ZÓLYA, É. G. (1985):Raport geologic de prospecţiuni geologice de mare detaliu, sc. 1:5000, executată în perimetrul Putna Întunecoasă Vest. (A geological study based on the geological mapping carried out in 1:5000 scale from the area west Putna Întunecoasă). Doc. Dept. of IPEG "Harghita", Miercurea-Ciuc, Manuscript.
ZÓLYA, L., ZÓLYA, É. G. (1986):Raport geologic privind lucrările de prospecţiuni geologice de mare detaliu, sc. 1:5000, executată în perimetrul Tilalmas-p.- Halaság, zona Jolotca. (A geological study based on the geological mapping carried out in 1:5000 scale from the area of the Tilalmas-Halaság spring). Doc. Dept. of IPEG "Harghita", Miercurea-Ciuc, Manuscript.

Manuscript received 15 November, 1994.