Acta Mineralogica-Petrographica, Szeged, XXXVI, 129–142, 1995

PETROGRAPHICAL STUDY OF SUBVOLCANIC ROCKS SURROUNDING OF MÓRÁGY AND ÓFALU (SE-TRANSDANUBE, HUNGARY)

CS. SZABADOS*

Department of Mineralogy, Geochemistry and Petrography, Attila József University

ABSTRACT

Rock types described as bostonites by MAURITZ and CSAJÁGHY (1952), JANTSKY (1972) are characterized in this paper. They can be subdivided into two groups: (1) Light-reddish, brownish-coloured, fine-grained rock characterized by trachytic texture with potassium feldspar microlites in the groundmass showing a subparallel arrangement among K-feldspar phenochrysts forming by flow parallely with the wall-rock. This type occurs only in dykes which penetrate the granite mass. On the basis of petrographical examinations this group is classified as alkalitrachyte. (2) Greenish, greyish-coloured, fine-grained rock characterized by a micro-holocrystalline, porphyritic texture. It forms a small laccolith-like subvolcanic body in the quarry of Kismórágy No. 5. and like a centre, dykes run from here to every directions. On the basis of petrographical examinations this group is classified as trachyandesite (or latite).

INTRODUCTION

The researched rocks outcrop in the territory of Mórágy, Kismórágy, Bátaapáti and Ófalu (*Fig. 1.*), but they occur in the boreholes of Alsónána No. 1 and 2., too. As pebbles they also appear in the NE Mecsek Mountains (SZAKMÁNY and JÓZSA 1994).

The origin and age of these rocks are unsettled question. MAURITZ and CSAJÁGHY (1952) regarded them bostonites on the basis of their mineralogical composition and major element content which can be ranged them into the products of granitoide magmatism or the Early Cretaceous volcanism.

Using the bostonite term is fitting if the origin of these rock-types are really granitoid. Bostonite ("soda-trachyte-aplite", TRÖGER 1935) is the silky, leucocratic, faneritic, hypabyssal syenitic dyke-rock. It is characterized by a trachytic or flow texture in which lath-like feldspar grains are arranged in a rough, but no perfect, parallelism or in radiating patterns. The groundmass consist mostly of alkali feldspar at least in 90% portion. The porphyritic version contains feldspar phenocrysts. The feldspar may be orthoclase, microcline, sanidine, anorthoclase or albite. Biotite, alkali amphibole or pyroxene form the scarce ferromagnesian minerals. Quartz in small amounts (max. 10%) is almost always present, particularly in the matrix. According to ROSENBUCH (1907) every type which has more than 90% alkali feldspar (plagioclase is or no), may be classified as bostonite rock. This term has been used rarely in the modern literature, moreover the Glossary of Geology (1980) does not recommend the usage of bostonite name.

K/Ar age of examined rocks is ranged in Early Cretaceous (106–117 Ma, ÁRVÁNÉ S. E. 1987). A "Bostonite" and an Early Cretaceous alkaline basalt dyke contact penetrated by

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

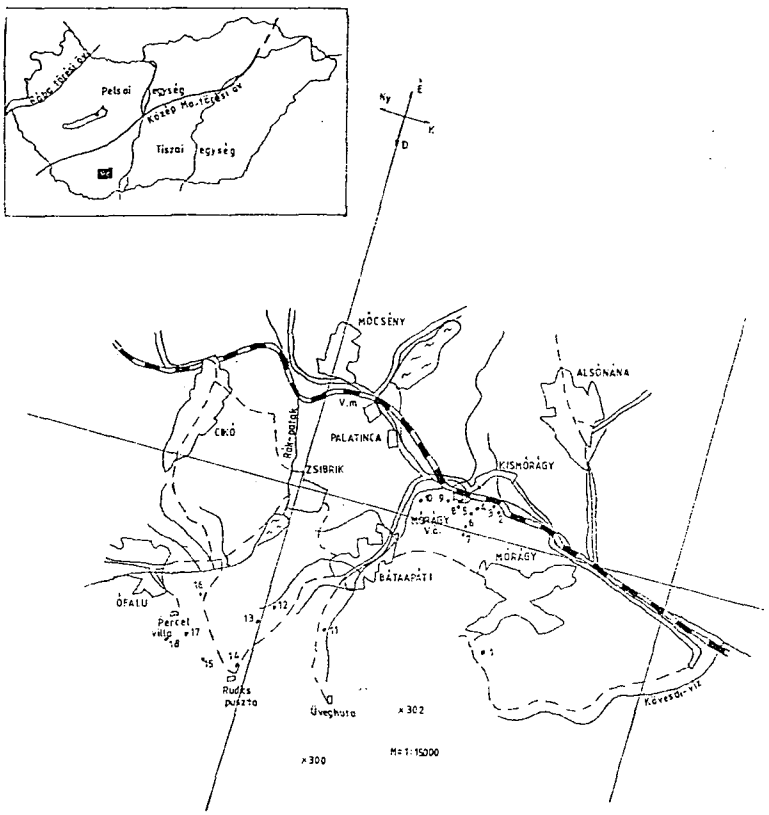

Fig. 1. Occurrence of the subvolcanic trachytic rocks in the investigated area
1. Mórágy quarry (reddish dyke), 2. Kismórágy quarry (reddish dyke), 3. Kismórágy quarry (reddish dyke), 4. Kismórágy quarry, No. 6. (greenish dyke), 5. Kismórágy quarry, No. 5. (greenish laccolith), 6. Kismórágy quarry, No. 3. (reddish dyke), 7. Kismórágy quarry, No. 1. (reddish dyke), 8. Kismórágy quarry, No. 10. (greenish vein), 9. Kismórágy quarry (reddish dyke), 10. Kismórágy, outcrop (reddish dyke), 11. Bátaapáti, outcrop (reddish dyke), 12. Bátaapáti Köves-creek, outcrop (reddish dyke), 13. Bátaapáti Köves-creek, outcrop (reddish dyke), 14. Rudics farm, outcrop (reddish dyke), 15. Ófalu, Aranyos-valley, outcrop (reddish dyke), 16. Studer valley, outcrop (reddish pebbles), 17. Ófalu, Aranyos-valley, outcrop (reddish dyke), 18. Ófalu, Till farm-valley, outcrop (reddish dyke).

the borehole Alsónána No. 1. suggests that the bostonite is younger than the Early Cretaceous volcanism (JANTSKY 1979). So, these (bostonite) rocks can be regarded Early Cretaceous alkalitrachytes, trachytes.

Aim of this paper to give a mineralogical-petrographic and tectonic characterization of these rocks using also field observations.

PETROGRAPHICAL CHARACTERIZATION

On the basis of the field observations, colour, mineralogical composition and textural features this trachytic group can be divided into two types: (1) Reddish-brownish coloured dyke rocks, (2) greenish-coloured laccolith-like rocks.

1. Reddish-brownish dyke-rocks

Aphyric, from fine-grained to slightly porphyric, visibly fluidal arrangement compact rocks occuring as 0.1 m to 20 m thick veins or dykes which penetrate the granite (*Fig. 1.* No. 1, 2, 3, 5, 7, 9–15). Generally these penetrations are in relations with faults and close to their contacts typical granite mylonite stripes with calcite veinlets are characteristic. However, some dykes invade into metamorphic rocks, too (Ófalu Formation in the valleys East of Ófalu *Fig. 1.* No. 17, 18).

Spatial arrangement of dykes shows a predominant E-W orientation (*Fig. 1.* No. 1, 6, 12), but N-S and NE-SW ones also occur (*Fig. 1.* No. 2, 3, 7, 9, 15, 17). Dip of dykes are steep, 75°–90°. Their rocks contain naked eye feldspar phenocrysts, rarely. Tabular sanidine in 1 cm size, and red-stained tabular orthoclase crystals are embedded into the microcrystalline groundmass. But the smaller portion of these phenocrysts are empty cavities or pseudomorph calcites surrounded by limonite coat.

On the basis of their granulation these rocks can be divided into two subtypes:

(1) Fine-grained, light coloured rocks without phenocryst located into the thin (0,6 m thick) veins (*Fig. 1.* No. 6, 18).

(2) Phorphyric, fine-grained, dark-coloured rocks having a coarser groundmass than that of the previous type (*Fig. 1.* No. 1, 17, 18). A naked eye fluid texture is characteristic.

1.1. Description of typical outcrops of dyke rocks

1.1.1. Dyke in the granite quarry at Mórágy free time centre

A 2.8–3.4 m thick dyke outcropping the southern side of quarry having a 6–8 m height is open along its strike in 10 m length (*Fig. 2.*). This rock penetrate the granite next to a fault having 360°/85–90° dip. The northern side of dykes is fractured. A 1–2 cm thick calcite vein marks the contact of dyke and granite. A 1–2 m thick and strongly sheared granite wall-rock accompany the dyke with a network of calcite veinlets.

Megascopically the rock is reddish in colour and ranged into the 2. type.

Microscopically it shows a microholocrystalline trachytic texture (*Fig. 3*) and the microlites of groundmass manifest more or less fluidal arrangement. The oriented samples shows that the dyke material flowed from East to West (before the rock solidification). The groundmass consist mostly of lathy, elongated perfectly crystallized alkali feldspar, mainly sanidine. The lath-like feldspars are arranged parallely, but near the phophyritic crystalls they follow their outlines. Average grain size of groundmass material measures 24×240 μm. They form 85% portion of the rock. Sanidine phenocrysts are scarce and their average size is 144×780 μm. (*Fig. 4.*). Xenomorphic quartz fills the interstitial places between sanidines in the groundmass giving 10% portion of the rock. Idiomorphic quartz in typical hexagonal prism also occurs. Limonitization and hematitization are rather common. Limonite (2% of the groundmass) display as unshaped, reddish-brownish-coloured patches originating from the breakdown of pyrite but in several parts of the rock small fresh pyrite hexaeders are preserved. In the groundmass are a lot of very small grains of zircon (8×7 μm). Opak minerals are also visible sporadically in less than 2% portion. Secondary minerals are calcite and calcedony after decay of feldspars (1% of the groundmass). On the basis of mineralogical composition this rock can be classified as alkaliquartztrachyte.

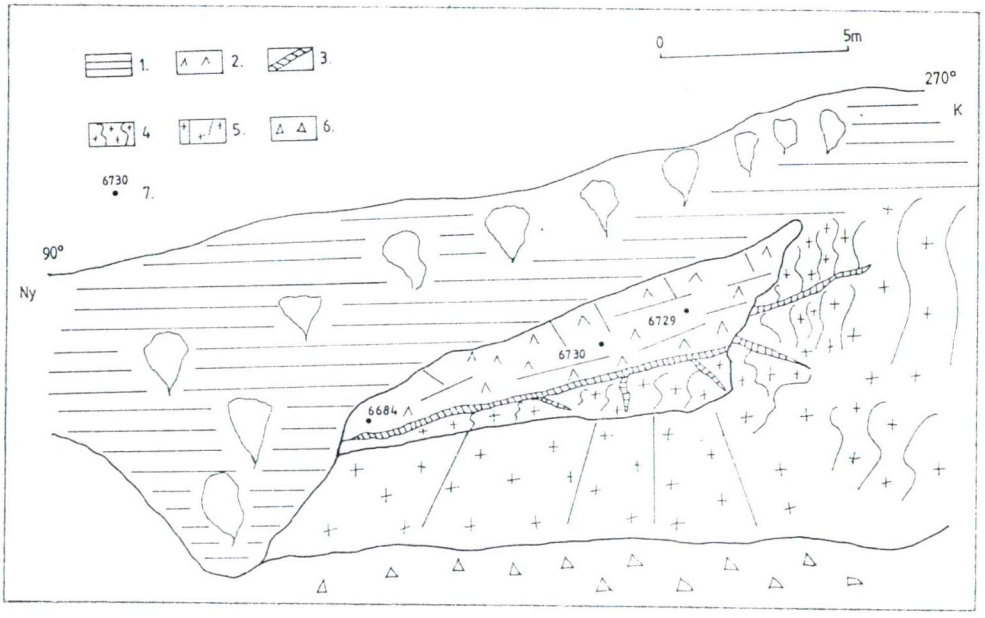

Fig. 2. Sketch about the alkaline dyke rock with trachytic texture in the granite. Mórágy quarry. Legend: 1. soil, 2. reddish-coloured dyke, 3. calcite vein, 4. granite mylonite, 5. medium-grained granite, 6. debris, 7. sampling locality and number of samples.

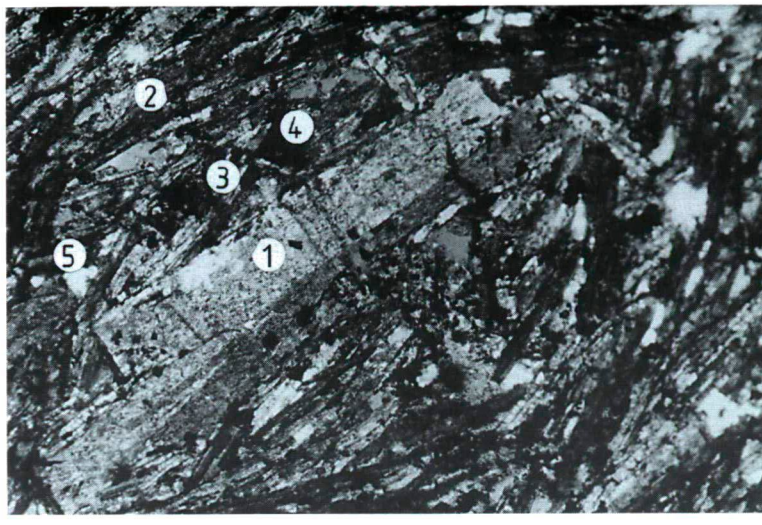

Fig. 3. Microholocrystalline trachytic texture with phenocrysts of sanidine from the Mórágy quarry. 1. phenocrysts of sanidine, 2. fluidal arrangement of alkali feldspar laths, 3. limonite, 4. pyrite, 5. quartz. 100x, +N.

Fig. 4. Sanidine penetration from Mórágy quarry. 100x, +N.

1.1.2. Dyke in the granite quarry at Kismórágy No. 3.

The examined dyke rocks occur quarries located behind the Mórágy railway station (*Fig. 5.*). One of the typical occurrences is shown by *Fig. 6.* Here the dyke is 0.6 m thick only and intruded into a fault which has a 6–8 m high and broad slickenside. It is accompanied by 0.5 m thick tectonic breccia wall-rock with 10/85–90° dip, consisting of alkalitrachyte and granite mixture. Dip of the dyke is the same, and indentical with that of dyke of Mórágy granite quarry. Megascopically the rock is fine-grained type (1. type). Due to a lot of fissures and cooling stripes the dyke material is strongly altered.

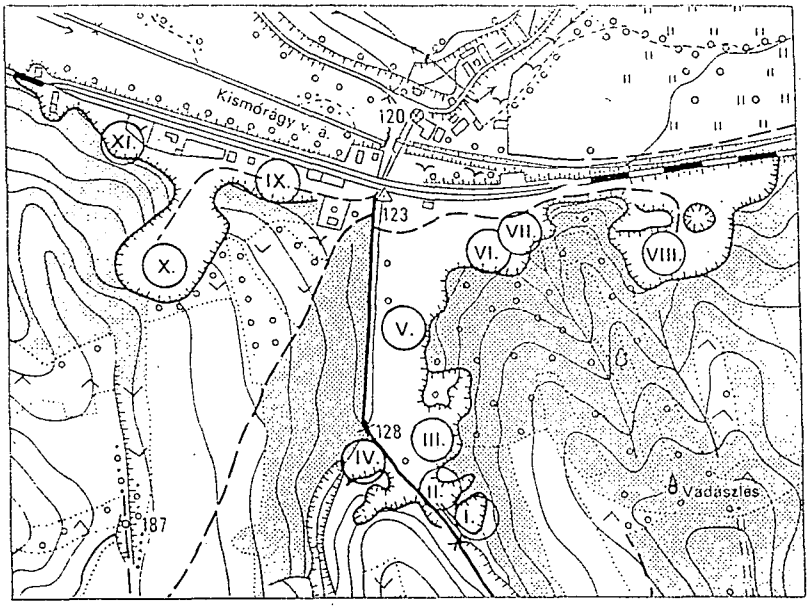

Fig. 5. Sketch about granite quarries at Kismórágy (SZEDERKÉNYI in FÜLÖP 1994)

The microscope shows a microholocrystalline, porphyric, trachytic texture corresponding to that of dyke of Mórágy quarry. Alkali feldspars of groundmass give about 90% portion of the rock, but they are strongly linonitized, calcitized and sericitized. These secondary minerals form 10–15% portion of the rock. Secondary quartz is less than 5% forming little xenomorph grains. Mafic minerals are do not occur or invisible.

The laths of alkali feldspar of groundmass are only 10×70 μm long. The oriented sampling shows that the dyke material flowed from East to West before the melt solidified in the same way as the dyke of Mórágy did. This dyke contains feldspar phenocrysts, too. Optically these are negative, their crackings are very dens and they probably are orthoclase, but in highly sericitized state. Their average grain size measures 2250×1560 μm. On the basis of mineralogical composition this rock can be classified as alkalitrachyte.

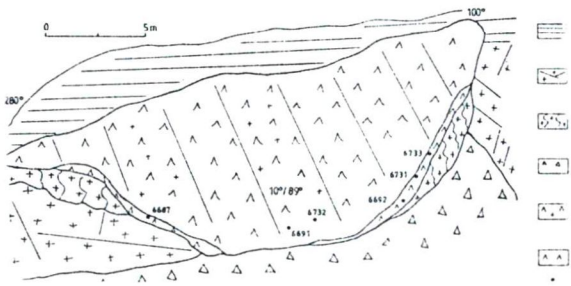

Fig. 6/a. Sketch of alkali dyke rock with trachytic texture and his breccia in the granite. Kismórágy quarry, No. 3. Legend: 1. soil, 2. fractured granite, 3. granite mylonite, 4. debris, 5. reddish-coloured dyke and slickenside accompained by granite breccia wall-rock, 6. reddish-coloured dyke, 7. sampling locality and number of samples

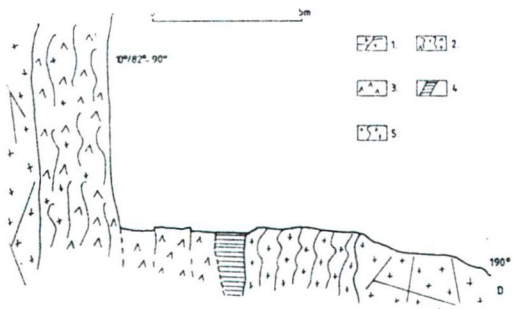

Fig. 6/b. Sketch of alkali dyke rock from frontial situation. Kismórágy quarry No. 3.
Legend: 1. fractured granite, 2. red dyke and slickenside of accompained granite breccia wall-rock, 3. red dyke, 4. calcite vein, 5. granite mylonite.

1.1.3. Ófalu: Aranyos-valley and Till farm-valley

East of Ófalu in several valleys reddish-coloured, trachytic textured dykes or sills occur penetrated into the metamorph rocks. In the occurence of Aranyos valley (500 m towards South of Percel farm, right side of the bank of creek) the dip of dyke is 310°/83° and it length is 20 m (*Fig. 7.*). Due to the tectonical fracturing the border of this dyke is not definable.

Megascopically the hard and relative fresh rock is red, brown coloured and ranged into the 2. type. 1×0.2 cm large sanidine naked eye phenocrysts are visible with tipical cross-cracking.

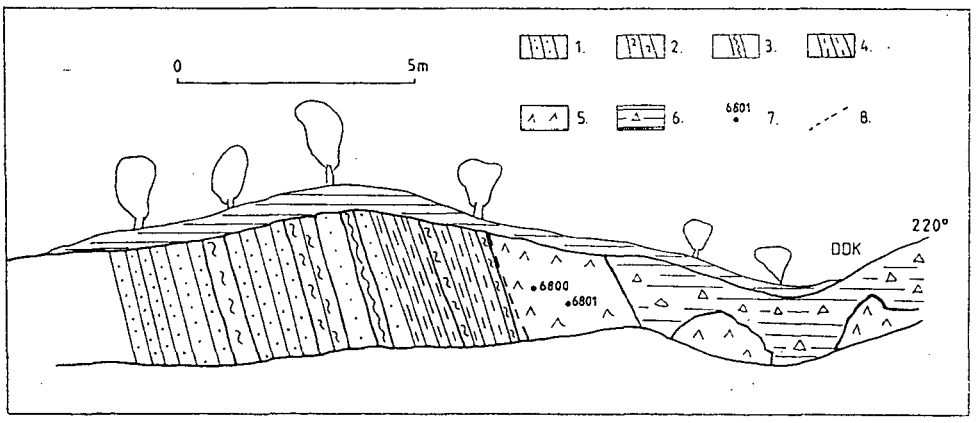

Fig. 7. Sketch of alkali dyke rock with trachytic texture in metamorphic surroundings, Ófalu, Aranyos-valley. Legend: 1. metasandstone, 2. sericitized micaschist, 3. migmatite, 4. clay schist and silica schist with chert, 5. reddish-coloured dyke, 6. soil, 7. sampling locality and number of samples, 8. fault.

Microscopic feature of this rock is also trachytic with fluidal arrangement of strongly sericitized feldspar groundmass. Phorphyric sanidine crystals characterized by 100 plane and typical cross-cracking (*Fig. 8.*) occur with a fairly big frequency. Their average size measures 2460×1140 μm. A lot of phenocrysts are altered and surrounded by wreath of very small zircon minerals. On the basis of mineralogical composition this rock can be classified as alkalitrachyte.

In the Till farm-valley (700 m towards the South of the farm, located on the both side of the creek) at the hydrological object a dyke and abundant debris of this dyke occur. Length of the outcropped dyke in the metamorphic sericite schist is 4 m, and its material is strongly fractured. Rather dense red spottedness is conspicuous on the rock. In the centre of every patch 1×0.5 cm big feldspar table is observable (*Fig. 9.*).

Microscopic features are similar to that of the rock of Aranyos-valley, but here the phorphyries are orthoclase crystals. The rock is strongly altered, the feldspars are surrounded by wide solution stipes with red-coloured, unshaped limonites. On the basis of mineralogical composition this rock is also classified as alkalitrachyte.

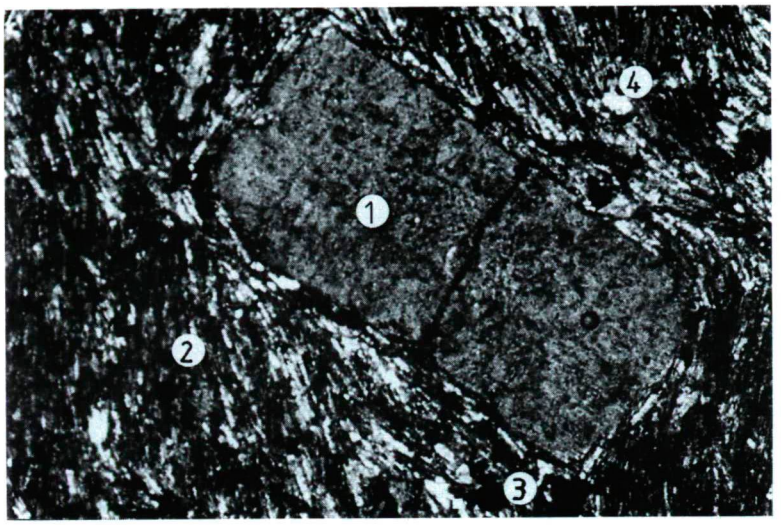

Fig. 8. Sanidine phenocryst in the microholocrystalline trachytic groundmass from Ófalu, Aranyos-valley.
Legend: 1. sanidine, 2. fluidal arrangement of alkali feldspar laths, 4. pyrite, 4. quartz. 50x, +N.

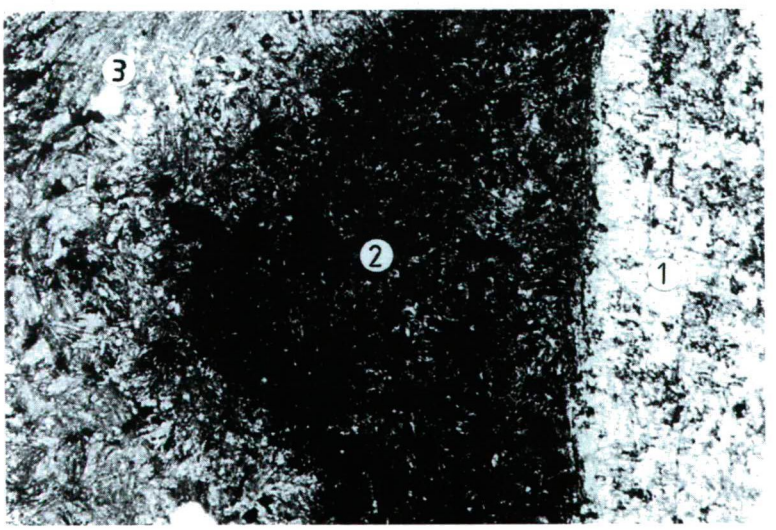

Fig. 9. Weathering of feldspar phenocryst. Till farm-valley.
1. feldspar, 2. limonitized, weathered part, 3. alkali feldspar laths of groundmass. 50x, +N.

2. Greenish-coloured, microholocrystalline, porphyric rock forming a subvolcanic (laccolith) body

These rocks occur in Kismórágy No. 5, 6, 10 quarries, exclusively (*Fig. 5.*). The bigest outcrop is found in the quarry No. 5. (*Fig. 10.*). In this quarry the rock-body shows very complicated surface having 30°, 70° or 90° dip. It resembles to a small 40 m long and 5–20 m high and 10–20 m broad laccolith body with a dome configuration. Eastern side of the outcrop a fault is found with 360°/60° dip. Left from it a "layered dyke" occurs. Inner part of this "layered dyke" becomes gradually decayed and it turns into clayey consistency. 1–2 cm thick calcite crust and 2–3 cm thick undefinable greenish-coloured, gelatinous material

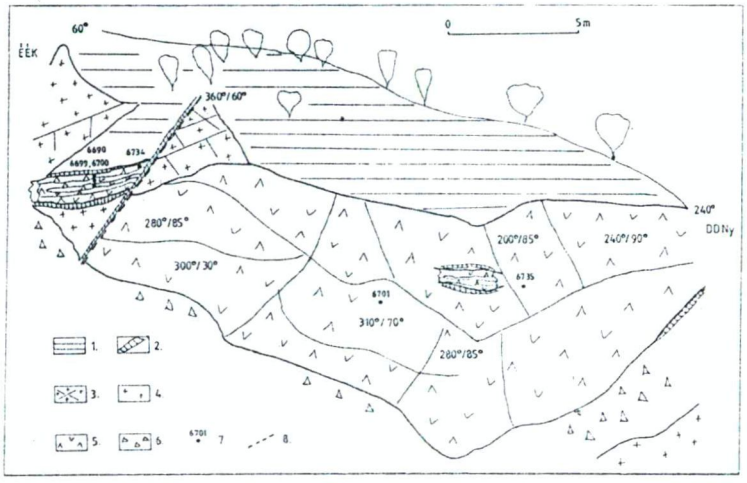

Fig. 10. Sketch of subvolcanic laccolith in Kismórágy quarry, No. 5.
Legend: 1. soil, 2. calcite vein, 3. fractured granite, 4. coarse-grained granite, 5. green-coloured intrusion (laccolith), 6. debris, 7. sampling locality and number of samples, 8. fault.

cover the rock body which may exist as a remnant of an inner contant of laccolith. Its exocontact zone is hidden in the strongly fractured closing granite. Probably the elevating melt of laccolith crushed and arched the granite above the dome. Apart from the local fracturing, the closing large granite mass was impermeable, therefore volatiles of the laccolith were trapped within the subvolcanic body and covering brecciated granite causing a powerful decomposition in them. During the period of this autometasomatism the iron content of the laccolith could not oxidizing so the greenish colour became widespread.

Besides the laccolith subvolcano the greenish-coloured trachyandesites as 1–3 m thick dikes also occur in the Kismórágy quarry No. 6. (*Fig. 11.*) and No. 10. In the latter has

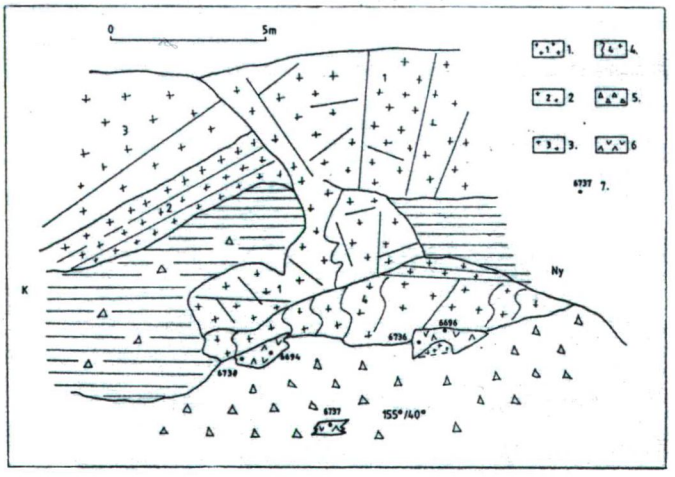

Fig. 11. Sketch of subvolcanic dyke rocks from Kismórágy quarry, No. 6.
Legend: 1. medium-grained granite, 2. fine-grained granite, 3. coarse-grained granite, 4. granite-mylonite 5. debris, 6. green-coloured dyke rocks, 7. sampling locality and number of samples

152°/40° dip and the dyke is represented by strongly-folded rock. These greenish-coloured dykes occupy more than 150 m^2 area in the quarries. A direct connection between the laccolith and dykes is not recovered yet.

Megascopically, every trachytic rocks of mentioned quarries are similar to each other i. e.: fine-grained, greenish-, greyish-coloured, homogeneous, massive rocks with fine calcite network.

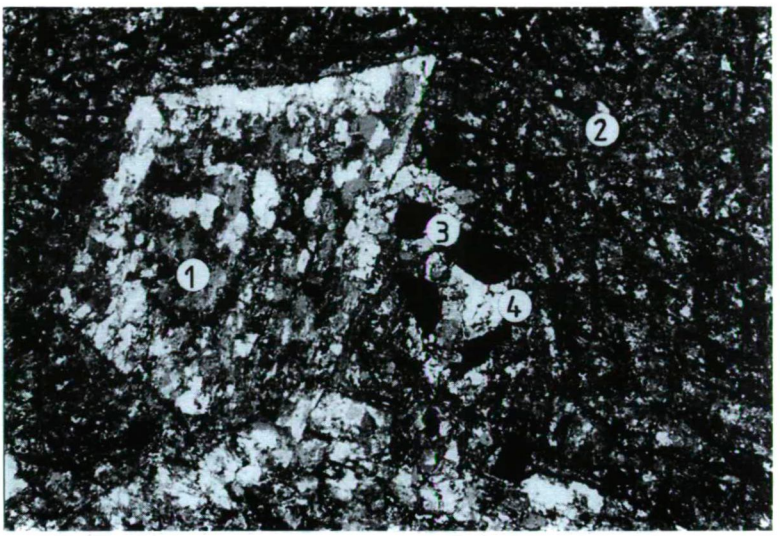

Fig. 12. Tabular feldspar in the sericitized, glassy groundmass from Kismórágy quarry, No. 5. 1. feldspar phenocryst, 2. radiating feldspar crystal germs, 3. pyrite, 4. calcite. 50x, +N.

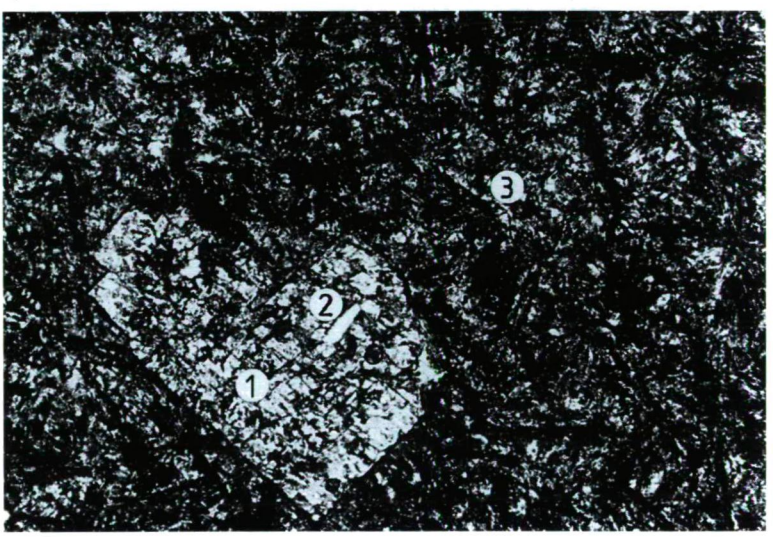

Fig. 13. Sericitized tabular feldspar phenocryst with apatite embedded into the microholocrystalline groundmass from Kismórágy quarry, No. 6. 1. feldspar, 2. apatite, 3. groundmass. 50x, +N.

The microscope shows an altered microholocrystalline porphyric texture with trachytic base. In the groundmass there are a lot of crystal germs and sometimes glass (*Fig. 12.*), suggesting a quick cooling. Needle-shaped minerals in the groundmass (feldspar is 80×10 μm) settled down radially and their quantity reach the 70–90%. Slight fluidal arrangement is characteristic in the dyke rocks, exclusiveley. The groundmass is strongly calcitized, cloritized, sericitized and clayey. Opak minerals are fairly abundant (3% of the groundmass). Pyrite, limonite (5% of the groundmass) are visible mainly next to the feldspar phenocrysts (*Fig. 12.*). Apatite also occurs and, it measures 90×25 μm (*Fig. 13.*). Mafic minerals were probably amphiboles but nowadays they exist only as pseudomorphs consisting of limonite, opacite and mainly calcite (10–30% of the groundmass). These pseudomorphs are surrounded by carbonatic or clay minerals as well as limonite. The phenocrysts are tabular feldspars and amphibole pseudomorphs. Their bigest measurement is 3300×1600 μm. Quartz is less than 3%.

On the basis of mineralogical composition this rock is qualified as subvolcanic trachyandesite (or latite) which have phenocrysts of plagioclase and K-feldspar in nearly equal amounts, little or no quartz and from fine-crystalline to glassy groundmass. The latter consists of undeterminable feldspars.

CONCLUSIONS

Two different trachytic subvolcanic rock-types are recognized in the valleys of Mórágy, Kismórágy, Bátaapáti, and Ófalu. On the basis of their relations, modal composition, macroscopic and microscopic features, using the IUGS nomenclature they can be classified as follows:

1. Alkalitrachytes. Reddish-coloured, fine-grained, oxidized rocks which occur only as dykes. Their srikes E-W are in general, but subordinatelly N-S and NE-SN ones also occur. Macroscopic features of these rocks are really similar to that of the scarcely occuring "bostonite" reference rocks. The microscope shows microholocrystalline, porphyritic, trachytic texture and alkali feldspar microlites more or less fluidal arrangement with phenocrysts of sanidine.

2. Trachyandesites (or latites). Greenish-coloured, fine-grained strongly calcitized rocks which occur in two kind of forms: local intrusion (probably laccolith) and related dykes. The microscope shows a microholocrystalline, porphyritic texture with trachytic base. The phenocrysts are strongly altered feldspars, probably plagioclase and sanidine or orthoclase in nearly equal amounts. The groundmass are from microcrystalline to glassy which may consists of obscure feldspars.

These petrographic estimations require through geochemical confirmation carried out on every rock-type written in this paper.

REFERENCES

ÁRVÁNÉ S. E., BALOGH K., RAVASZNÉ B. L., RAVASZ Cs. (1987): Mezozoós magmás kőzetek K/Ar kora Magyarország egyes területein. MÁFI Évi jelentés. 1985. évről, 295–307.

ÁRVÁNÉ S. E., RAVASZNÉ B. L. (1992): A Mecsek és a Villányi hegység között feltárt kréta telérkőzetek K/Ar kora. MÁFI Évi jelentés. 1990. évről, 229–240.

BATES R. L., JACKSON J. A. (1980): Glossary of Geology

FÜLÖP J. (1994): Magyarország geológiája, Paleozoikum. II. Akadémiai Kiadó, 306–317.

GHANEM, M. A., RAVASZNÉ, B. L. (1969): Petrographie study of the crystalline basement rocks Mecsek Mt. Hungary. Acta Geol. Ac. Sci. Hung., 191–219.

HETÉNYI R., HÁMOR G., FÖLDI M., JANTSKY B. (1976): Magyarázó a Mecsek-hegység földtani térképéhez 10000-es sorozat. Ófalu, 31–39.
HUNTER, M., ROSEMBUCH, H. (1890): Über Monchiqit, ein Camptonitisches Ganggestein aus der Gefolgschaft Elaolithsyenite. Tschermarks Petr. Mitt. **11**, 447.
JANTSKY B. (1950): A mecseki kristályos alaphegység földtani viszonyai. MÁFI Évi Jelentés. 1950. évről, 65–77.
JANTSKY B. (1979): A mecseki gránitosodott kristályos alaphegység földtana. MÁFI Évkönyv LX., **30**, 147, 150.
JÁRÁNYI K. (1970): A Mórágy környéki gránitoid kőzetek vizsgálata, különös tekintettel a gránitosodás folyamatára. Manuscript. ELTE Budapest, 52–54.
JOHANSEN, A. (1937): A descreptive petrography of the igneous rocks. The University of Chicago Press. Vol III, 26–27. Vol IV, 22–23.
LE MAITRE, E. W. (1989): Classification of igneous rocks and glossary of terms. Blackwell Scientific Publications, London.
KOCSI Z. (1995): A Mórágyi rögben található alsó kréta korú bosztonitok térbeli elhelyezkedése és petrográfiája. Manuscript. JATE Szeged.
MAURITZ B., Csajághy G. (1952): Alkáli telérkőzetek Mórágy környékéről. Földtani Közlöny **82**, 137–142.
PANTÓ Gy. (1980): Ritkaföldfémek geokémiája és néhány alkalmazási területe. Doktori Értekezés. MTA Könyvtár, Bp. 101–121.
ROSENBUCH, H. (1907): Mikroskopische Physiographie der Mineralien und Gestein I. Stuttgart. Band II, 600–607.
SORENSEN, H. (1974): The alkaline rocks. John Wiley and Sons Ltd. New York.
SZAKMÁNY GY., JÓZSA S. (1994): Rare pebbles from the miocene conglomerate of Mecsek Mountains. Hungary. Acta Miner. Petr. Szeged XXXV, Supplementum, 53–64.
SZÉKINÉ F. V. (1952): A magmás kőzetek szerepe a komlói kőszénöszletben. MTA Műszaki O. K. 5/3, 187–209.
TRÖGER I. E. (1935): Spezielle Petrographie Eruptivgesteine. Verlag der Deutschen Mineralogischen Gesellschaft V. Berlin, 81.