Acta Mineralogica-Petrographica, Szeged, XXXVIII, 37–50, 1997

PETROGENESIS OF TRACHYANDESITE AND TRACHYTE ROCKS IN THE MÓRÁGY HILL, SOUTH HUNGARY

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ABSTRACT

Two alkaline, geochemically different rocks can be found in many places in the granite mass of the Mórágy Hill and Ófalu Complex, which described as "bostonites" by Mauritz and Csajághy (1952). In earlyer petrographical and petrological articles the author proved that these rocks are not part of the Early Carboniferous granite magmatism, but consideration of these rocks happened parallely to that of the Early Cretaceous alkaline magmatism. The distribution of immobile trace elements of the trachiandesites of Kismórágy is very similar to the distribution of immobile trace elements of the Early Cretaceous phonotephrite rocks of the Mecsek Mts. While the distribution of immobile trace elements of trachytes of the Mórágy Hill and Ófalu Complex is very similar to the distribution of immobile trace elements of the Early Cretaceous phonolite rocks of the Mecsek Mts. The alkaline, trachyte rocks of the Mórágy Hill and Ófalu Complex are the saturated end-members of the Early Cretaceous alkaline rock series of the Mecsek Mts. I have a question, as a fallow: What kind of petrogenetic processes generated the trachyte rocks of the Mórágy Hill and Ófalu Complex?

INTRODUCTION

Two petrographically and petrologically different rocks are outcropping in the granitic mass of the Mórágy Hill:

1. *Trachyandesite.* Greenish-greyish coloured (the more altered types are yellow coloured, while the more fresh types are greenish coloured), fine-grained, strongly altered rocks with many calcite balls and veins. Some visible minerals of the rocks already have altered. These rocks form dykes and small stock (laccolith) like subvolcanic body in the quarries of Kismórágy No. 5. Dykes run from here, as a centre to every directions. The microscope shows a microholocrystalline, porphyritic texture with trachytic base. Their thin sections immediatelly indicate that the primary mineral composition of the rocks already have altered. I can found pseudomorphose after pyroxene or amphibole, unrecognizable feldspar phenocrysts (these were probably originally plagioclase minerals), apatite and oupaque minerals in the sericitized, calcitized, clayey and chlorotized groundmass. The needle shaped feldspars in the groundmass settled down radially, but slight fluidal arrangement is characteristic in the dyke rocks. On the basis of petrographically, microscopically, distribution of major and mainly immobile trace elements composition they are trachyandesites (Table 1., 2., 3.).

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2. *Trachyte.* Reddish-brownish coloured, 0.5–30 m thick, fine-grained rocks form only dykes in territory of the Mórágy Hill and Ófalu Complex. Orientation of the dykes is changeble. In the dyke rocks sometimes appear some little bit granite grains. Brecciated rocks from trachyte and granite material are also found. The microscope shows a microholocrystalline, porpyritic, trachytic texture. The rare phenocrysts are sanidines. The groundmass is made up of crystalline sanidines, albites of fluidal arrengement and some types I can found andesine minerals by microscope analysis. On the basis of quantity and quality of sanidines, quartz, limonites and andesines I can recognize minor differences among them. Based upon the microscopic, mycroprobe analysis, major and trace elements composition they are trachyte rocks (Table 1., 2., 3.).

TABLE 1

XRF analysis (Switzerland)

SAMPLE	II/M2 T	II/KM3 T	II/Bal2 T	I/KM18 Ta	I/KM19 Ta	I/KM20 Ta	II/KM10a Ta
SiO_2	66.42	65.65	63.48	52.3	50.37	48.72	54.35
TiO_2	0.2	0.16	0.2	1.28	1.16	1.4	1.25
Al_2O_3	16.24	17.39	17.56	17.31	15.49	15.74	16.62
FeOt	4.27	3.5	4.02	7.35	7.1	7.67	9.07
MnO	0.08	0.08	0.04	0.07	0.16	0.19	0.05
MgO	0.2	0.15	0.3	1.12	1.84	0.91	1.82
CaO	0.31	0.17	0.6	5.43	7.04	8.62	2.61
Na_2O	5.57	5.44	5.28	1.78	1.86	2.31	0.77
K_2O	5.41	6.62	7.23	6.1	5.67	3.99	8.53
P_2O_5	0.01	0.01	0.02	0.45	0.4	0.52	0.44
TOTAL	98.71	99.17	98.73	93.13	91.09	90.07	95.51
LOI	1.44	1.31	1.59	7.38	9.13	0.06	4.57
Cr	1	0	1	6	8	1	11
Ni	12	0	15	3	1	4	3
V	1	0	5	3	1	12	1
Cu	9	0	12	3	5	5	1
Pb	6	0	24	1	1	1	1
Zn	141	0	178	147	120	112	159
K	44910	54955	60018	50638	47068	33122	70810
Rb	150	180	217	221	173	135	226
Ba	87	0	51	249	352	276	228
Sr	32	0	20	67	129	103	40
Ga	36	0	36	24	18	22	25
Nb	167	0	204	110	93	93	100
Zr	915	0	1308	472	495	360	431
Ti	1199	959	1199	7674	6954	8393	7494
Y	91	0	79	43	40	41	38
Th	22	56	35	11.5	10.5	9.3	11.3
R1	1070.3	802.8	553	1209.7	1163.1	1265	1096
R2	361.2	366.5	422.8	975.7	1148	1275.5	695.2
S.I	17.60	10.79	3.32	8.67	2.88	2.75	11.49
DENSITY	2.37	2.36	2.38	2.52	2.54	2.57	2.51

TABLE 2

ICP-AES analysis (MÁFI)

SAMPLE	II/M1 T	II/KM5 T	III/Ar2 T	III/T8 T	I/KM14 Ta	I/KM16 Ta	I/KM18 Ta	II/KM8 Ta	II/KM9 Ta	II/TKM10b Ta
SiO_2	65.42	62.92	64.38	63.52	52	53.07	50.23	53.76	52.43	50.3
TiO_2	0.19	0.161	0.124	0.135	0.725	0.805	1.21	1	1.024	1.212
Al_2O_3	15.65	16.96	16.74	17.16	15.22	15.44	16.96	16.52	16.85	15.87
Fe_2O_3	4.18	4.94	4.68	4.14	5.93	6.45	5	7.08	4.28	2.96
FeO	0.24	0.2	0.02	0.02	2	1.84	1.84	1.68	2	7.45
MnO	0.121	0.088	0.087	0.015	0.171	0.228	0.065	0.05	0.049	0.085
MgO	0.37	0.61	0.45	0.3	1.77	1.77	1.43	1.58	1.74	2.51
CaO	1.03	1.05	0.67	1.04	5.67	4.14	6.42	2.45	5.61	3.96
Na_2O	4.64	5.03	5.04	5.65	1.16	1.4	1.91	1.22	1.67	1.24
K_2O	5.89	5.2	5.54	5.71	7.26	6.98	5.61	6.82	8.21	7.27
P_2O_5	0.1	0.1	0.1	0.1	0.18	0.17	0.28	0.24	0.24	0.33
TOTAL	97.41	96.76	97.36	97.38	91.49	91.65	90.45	91.69	93.67	92.89
H_2O	1.61	2.42	1.9	1.64	4.96	5.15	5.7	6.05	4.45	4.33
CO_2	0.12	0.06	0.02	0.06	3.13	2.06	3.24	0.95	2.31	2.55
LOI	1.73	2.48	1.92	1.7	8.09	7.21	8.94	7	6.76	6.88
Ni	2	4.5	2	2	2	2	2	2	2	2
Co	2	3	2	2	11	12	13	12	11	17
Cu	2.88	6	7	14	5	4	5	5	4	7
Pb	38.5	78	83	100	27	30	29	38	34	31
Zn	155	154	259	210	130	135	152	160	122	186
K	48895	43167	45989	47400	60267	57943	46570	56615	68154	60350
Ba	150	100	130	60	330	330	380	300	230	200
Sr	40	80	50	40	60	60	80	50	100	70
Ti	1139	965	743	809	4346	4826	7254	5995	6139	7266
R1	1217.3	1056.6	1083.2	783.1	1132.9	1175	1149.5	1305.8	792.9	899.5
R2	434.8	475	422	462.2	992.8	833	1089.7	663.98	1016.6	859.2
S.I.	23.74	19.33	21.13	12.12	5.0	5.69	4.34	18.82	–3.12	4.51
DENSITY	2.38	2.40	2.38	2.38	2.51	2.51	2.52	2.50	2.49	2.56

TABLE 3

INAA analysis (BME)

SAMPLE	II/M2 T	II/KM3 T	II/Ba12 T	I/KM18 Ta	I/KM19 Ta	I/KM20 Ta	II/KM10 Ta	II/M1 T	II/KM5 T	III/Ar2 T
Cr	1	0	0	0	0	0	0	8	7	10
Co	1	1.5	1.2	5.9	15	9	1	0	3	0
Sc	1	0.17	0.98	4	3.5	4.3	3.6	1	0	0
Zn	120	120	150	130	115	135	135	140	142	270
Mo	0	0	0	0	0	0	0	0	7.5	16
As	5.6	39	6.7	5.1	13.7	6.1	17.6	5.2	25.1	44.2
Se	17	32	20	11	9.5	10.6	9.5	20	31	40
Sb	0	0.88	1.1	0.48	0.68	0.59	0.95	0	1.2	1.04
Rb	123	180	200	170	135	110	180	170	190	305
Cs	50	6.6	1.7	3.9	1.95	3.5	4.8	0.62	6.1	2.2
Ba	87	0	51	360	450	320	250	0	0	210
Ta	8.4	14.8	10	5.5	4.7	4.8	4.9	9.6	15.6	19.3
Hf	20.7	35	27	11.1	11.9	8.9	10.4	24.5	34.3	35.8
Zr	1000	1400	1350	650	650	400	610	1050	1400	1300
Th	22	56	35	11.5	10.5	9.3	11.3	24.8	57.2	62
U	1.7	8.5	11	4.6	4.7	3.1	5.5	0	8.7	12.1
La	140	220	163	71	67	66	71	145	223	210
Ce	260	390	290	137	130	120	140	280	410	380
Nd	110	140	110	70	60	45	46	100	135	110
Sm	13.1	25.9	18.3	11.1	11.3	10.9	11.2	20.6	25.2	21.2
Eu	2.1	0.73	0.78	3.24	3.48	3.21	3.2	2.31	0.71	0.67
Tb	2.5	3.1	2.8	1.2	1.4	1.3	1.4	2.6	2.7	2.6
Tm	4.7	7.5	5.1	3.6	3.2	3.1	3.3	5.3	7.7	8.2
Yb	6.05	7.35	5.4	2.52	2.59	2.41	2.43	6.5	7.47	6.86
Lu	0.83	0.92	0.81	0.36	0.33	0.34	0.32	0.86	0.95	0.86
R1	1070.3	802.8	553	1209.7	1163.1	1265	1096	1217.3	1056.6	1083.2
R2	361.2	366.5	422.8	975.7	1148	1275.5	695.2	434.8	475	422

SAMPLE	III/Ar3 T	III/T8 T	I/KM14 Ta	I/KM16 Ta	II/KM8 Ta	II/KM9 Ta	II/KM10b Ta
Cr	11	12	9	6	8	10	6
Co	0	1	8	8	5	5	11
Sc	0	0	2	2	3	3	4
Zn	369	205	116	120	145	125	178
Mo	27	26	12.3	8.3	8.2	8.2	16.2
As	19	15.7	4.96	5.61	38.6	23.7	6.93
Se	57	41	9.9	11	10.9	14.4	9.6
Sb	1.26	1.2	0.28	0.26	0.47	0.45	0.26
Rb	240	250	170	165	200	198	162
Cs	1.8	0.8	6.3	7.4	7.8	5.9	3.7
Ba	430	0	370	380	360	330	220
Ta	28.1	19.9	4.97	5.2	5.44	5.61	4.91
Hf	49.5	40.5	10.3	10.5	11.2	12	10
Zr	2000	1700	610	550	700	780	650
Th	96	65	12.7	12.3	12.1	12.5	10.2
U	26.3	20.5	4.5	4.1	5.5	5.1	4.2
La	272	220	49.5	8.2	69.5	69.9	47.7
Ce	480	420	145	139	138	142	142
Nd	135	130	51	55	54	58	56
Sm	25.5	24.2	7.13	7.2	10.7	11.8	7.68
Eu	0.62	0.86	3.28	3.13	3.24	3.12	2.45
Tb	3.3	3.05	1.05	1.17	1.3	1.5	1.34
Tm	12	9	2.8	2.9	3.3	3.8	3.1
Yb	8.76	7.86	2.15	2.25	2.88	2.81	2.21
Lu	1.09	1.02	0.34	0.35	0.38	0.39	0.31
R1	0	783.1	1132.9	1175	1305.8	792.9	899.5
R2	0	462.2	992.8	833	663.98	1016.6	859.2

LEGENDS

LOCALITY OF SAMPLES: MÓRÁGY, Trachyte: II/M1, II/M2; KISMÓRÁGY QUARRY No. 3., Trachyte: II/KM3, I/KM5; KISMÓRÁGY QUARRY No. 5., Trachyandesite: I/KM18, I/KM19, I/KM20; KISMÓRÁGY QUARRY No. 6., Trachyandesite: I/KM14, I/KM16, II/KM8, II/KM9, II/KM10a-b; BÁTAAPÁTI, KÖVESPATAK-VALLEY, Trachyte: II/Ba12; ARANYOS-VALLEY, Trachyte: III/Ar2, III/Ar 3; TILLFARM-VALLEY, Trachyte: III/T8

T = Trachyte
Ta = Trachyandesite
R1 = 4Si-11(Na+K)-2(Fe+Ti)
R2 = 6Ca+2Mg+Al (De La Roche et al. 1980)
S.I. = 100 (Si-(Al+Fe_2^++Mg+3Ca+11Na+11K+Mn-Fe_3^+-Ti-4P)/2 (Fitton 1991)
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PETROGENESIS

The investigated rocks occur in the granite wallrock in the Mórágy Hill and in the clay- and mica shist at valleys of Ófalu. Therefore, some geologist thought that these rocks were the petrogenetic products of the granite magmatism and named them as "bostonites". Based upon the following evidences these rocks (trachyandesite and trachyte) of the Mórágy Hill (and Ófalu Complex) are the products of the Early Cretaceous alkaline magmatism:

1. The K/Ar data of the two different types of rocks show the Cretaceous age (Árva-Sós 1979, Szabados 1996).

2. The trace elements distribution of the rock series of one magmatic event is similar to each other. Therefore, we can decide whether rocks of the Mórágy Hill, what kind of magmatic events could connect.

Distribution of trace elements of the trachyandesites are the same in every occurences of Kismórágy (Table 1., 2., 3.). Distribution of trace elements of trachytes of the Mórágy Hill and Ófalu are similar to each other, but we can found some differences in the LIL elements. The LREE of trachytes of Kismórágy and Ófalu are little more than the samples of Mórágy and Bátaapáti (Table 1., 2., 3.). The average trace element pattern of trachyandesites of Kismórágy is very similar to the trace element patterns of trachyandesite and phonotephrite of the Mecsek Mts. (*Fig. 1.*). Secondary effects caused the differents of some LIL element (K, Br, Ba). The trace element patterns of trachytes of the Mórágy Hill and Ófalu Complex are partly similar to the trace element patterns of the phonolites of the Mecsek Mts. (*Fig. 2.*). But the trace element distribution of phonolite rock of borehole Báta No. 3 (482 m), Eastern side of the Mórágy Hill, is very similar to the trace element patterns of trachytes of the Mórágy Hill and Ófalu Complex.

3. Several analysis have shown that during the magmatic differentiation the coherent rates of two residual trace elements do not change significantly except when metasomatical alterations or alterations caused by volatiles play a significant role. Within one cogenetical series of rocks the following trace element rates are generally constant: Zr/Nb, Zr/Hf, Hf/Th, La/Nb etc. The applied trace element rates show that the granitic rocks (granite and rhyolite rocks) are not part of cogenetical series of the Early Cretaceous alkaline volcanic rocks of the Mecsek Mts. However, sample points of trachyandesites and trachytes of the Mórágy Hill and Ófalu Complex belong to the Early Cretaceous cogenetic series of alkaline volcanic rocks of the Mecsek Mts., this giving further support their cogenetical relationship (*Fig. 3.*).

4. The Th-Hf/3-Ta diagram (WOOD et al. 1979, WOOD 1980) shows the magma-tectonical location of the investigated trachyandesite and trachyte rocks of the Mórágy Hill and Ófalu Complex, the samples of the Early Cretaceous cogenetical rock series of the Mecsek Mts. and the samples of the granite and rhyolite rocks of the Mórágy Hill and Mecsek Mts. (*Fig. 4.*). Clearly visible that the samples of trachyandesites of Kismórágy together the samples of the Early Cretaceous cogenetical rock series of the Mecsek Mts. fall into the same area within the field of the basaltes and their differentiated rocks of the continental place (CAB). The samples of Th rich trachytes of the Mórágy Hill and Ófalu Complex with some samples of Th rich phonolites (Báta No. 3) fall out from this area (CAB) close to Th.

5. The Early Cretaceous cogenetical rock series of the Mecsek Mts. are generated mainly by fractional crystallization (BILIK 1983, DOBOSI 1985, HARANGI 1993). The fundamental principles of the fractional crystallization are found in the trachyandesite and trachyte rocks of the Mórágy Hill and Ófalu Complex.

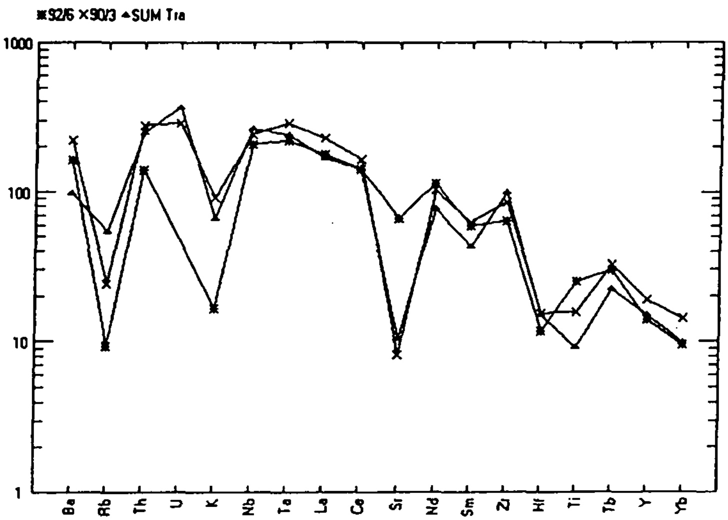

Fig. 1. Trace element distribution of phonotephrite (92/6-Hidasi-valley), trachyandesite (90/3-Balázs Hill) of Mecsek Mts. and trachyandesite of Kismórágy (SUM Tra-average trace element distribution), normalized to the average chondrite

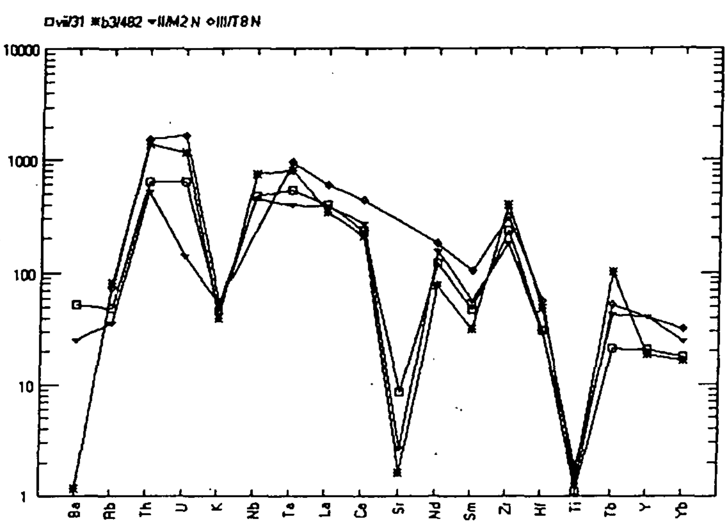

Fig. 2. Trace element distribution of phonolite (vii/31-Mázai-valley), phonolite (b3/482-Báta borehole No. 3. 482 m) of Mecsek Mts. and trachyte (I/M2-Mórágy, III/T8-Tillfarm) of Mórágy Hill and Ófalu Complex, normalized to the average chondrite.

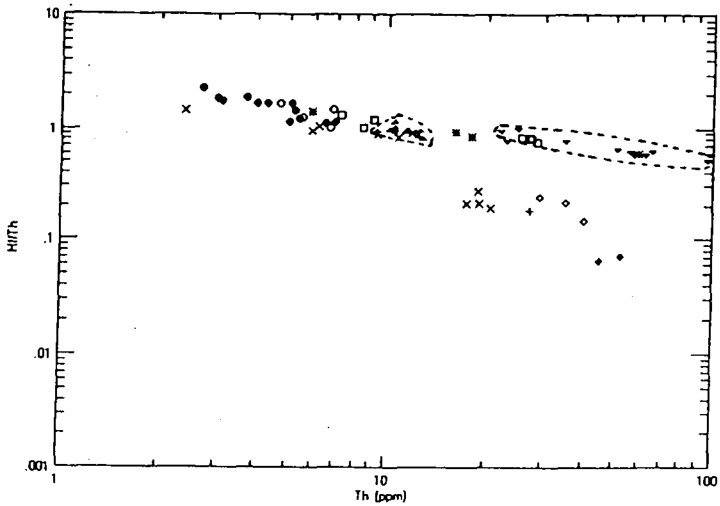

Fig. 3. The plots of Th-Hf/Th show the cogenetic rock series of the Early Cretaceous alkaline rocks of Mecsek Mts., the trachyandesite-trachyte rocks of Mórágy Hill and Ófalu Complex.
Legend: Circle-Filled-basalte; Circle-Open-basanite; Box-Open-phonotephrite-phonolite; Triangle-Filled Up-trachyandesite of Kismórágy; Triangle-Filled Down-trachyte of Mórágy and Ófalu; x-basalte LOI>4%; Asterix-tephriphonolite-phonolite LOI>4%; X-Rhyolite; +-Resistite; Diamond-Open-Granite; Diamond-Filled-Microgranite
Circles of dotted line shows the places of the trachyandesites and trachytes of Mórágy Hill and Ófalu Complex

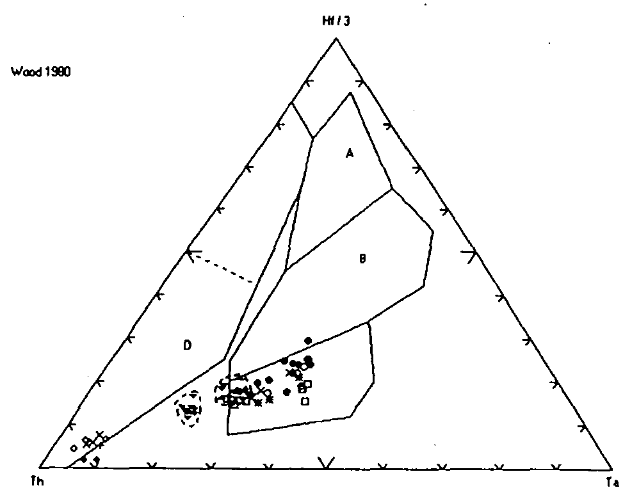

Fig. 4. The plots of Th-Hf/3-Ta (Wood 1980) show the Early Cretaceous cogenetic rock series, the trachyandesite-trachyte rocks of Mórágy Hill and Ófalu Complex, the rhyolites of Mecsek Mts. and the granite rocks of Mórágy Hill.
Legends are in the *Fig. 3.*

THE FRACTIONAL CRYSTALLIZATION MODELL OF COGENETIC ROCK SERIES OF THE MECSEK MTS. AND THE MÓRÁGY HILL

According to the new research the alkaline cogenetic rock series can be devided as two comagmatic rock series (HARANGI 1993):

1. ankaramite-alkaline-basalte-...
2. Na-basanite-phonotephrite-tephriphonolite-phonolite

The composition of initial liquid still have disputed.

I investigated the distribution of major and trace element of trachyandesites of Kismórágy and trachytes of Mórágy and Ófalu which together closely connect with Early Cretaceous cogenetical rock series of the Mecsek Mts. The TAS (LE MAITRE 1989), the R1-R2 (DE LA ROCHE 1980) and the S. I. diagram (FITTON 1991 in HARANGI 1993) shows the major element distribution of these rock series (*Fig. 5., 6., 7.*). Clearly visible that the volcanic rock series separate two different series at the intermediate types of rocks:

1. saturated series (trachyandesite-trachyte...)
2. undersaturated series (phonotephrite-tephriphonolite-phonolite).

The Si content is increasing in the saturated series. The question is the following: occure high Si content rock type (rhyolite) in the Early Cretaceous magmatism, or not?

The major element distribution of these rocks may have been influenced by primary and secondary factors (autohydratation, hydroterms). Therefore their evaluate are difficult. On the basis of principle of fractional crystallization modell applied for the Early Cretaceous cogenetical rock series of the Mecsek Mts. (BILIK 1983, DOBOSI 1985, HARANGI 1993) and for the trachyandesites of Kismórágy and trachytes of Mórágy-Ófalu. I tryed to deduce the process of the fractional crystallization based upon the Reyleigh Eguation (VILLEMANT et al. 1981, HARANGI 1990). I applied the Hf as the element of the differentiation (CS. SZABADOS 1996, in Ph. D. dissertation). The primary melt was probably a basalte-basanite melt. The continous crystallization process change at the intermediate types (Hf=6.9–14.85). The SiO_2 content is increasing (quartz crystalling in the trachyte), FeO_t, TiO_2, CaO and the transitional metals content are strongly decreasing (during the crystallization of the clynopyroxene and Fe-Ti-oxide), while the Al_2O_3 content become. The CaO, Sr, Ba, Eu content are decreasing rapidly, while the Na_2O, K_2O, Rb are increasing. These elements are indicating the crystallization of the K-feldspars. Result of hydrotermal processes and later solutions the K_2O, and Rb content were increasing while Na_2O was decreasing gradual in the K-rich trachyandesitic rocks of the Mecsek Mts. and the Mórágy Hill too. Apatite appear in the intermediate rocks (P_2O_5, Nd, Sm, Eu, Tb) still, but it isn't in the trachyte rocks. The high REE content in the trachyte rock are caused by accessory minerals (e. g. zircon). The clinopyroxene, Fe-Ti-oxide, sometimes amphibole (Sás-valley) are remaining longer in the melt of the undersatured series (TiO_2, FeO_t, Al_2O_3, CaO, transitional metals, MREE, HREE, Ta). Apatite is remaining ruling minerals in the phonotephrite type (P_2O_5, MREE). The plagioclase minerals are crystallizing in the saturated series earlyer than in the undersatured series. It is marked by the lower Sr, Ba), CaO content. The constant Hf/Zr and Hf/Th rates show that rocks of the Mecsek Mts. and investigated rocks of the Mórágy Hill are part of the one cogenetical series.

I think we have not enough information from the Early Cretaceous magmatism, therefore, my modell is a hypothesis only.

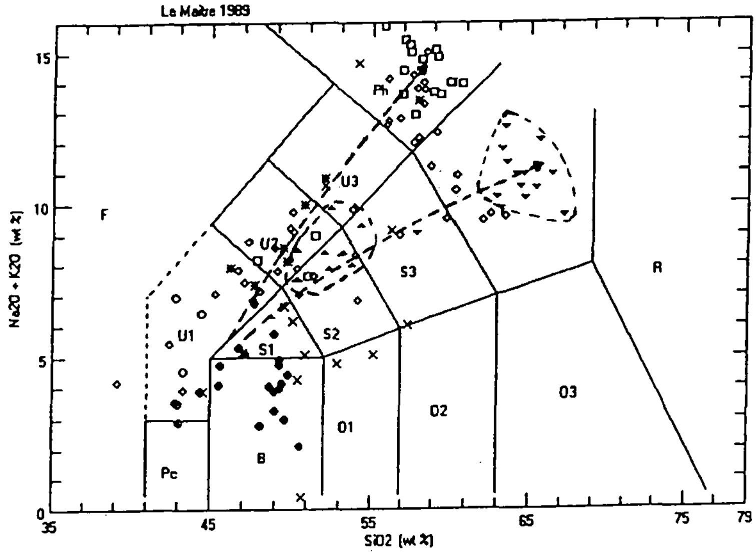

Fig. 5. The major element distribution of Early Cretaceous rock series of Mecsek Mts. and the trachyandesite-trachyte rocks of Mórágy Hill and Ófalu Complex in the TAS diagram (LE MAITRE 1989). Arrow of dotted line shows the differentiation processes.
Legends are in the *Fig. 3*.

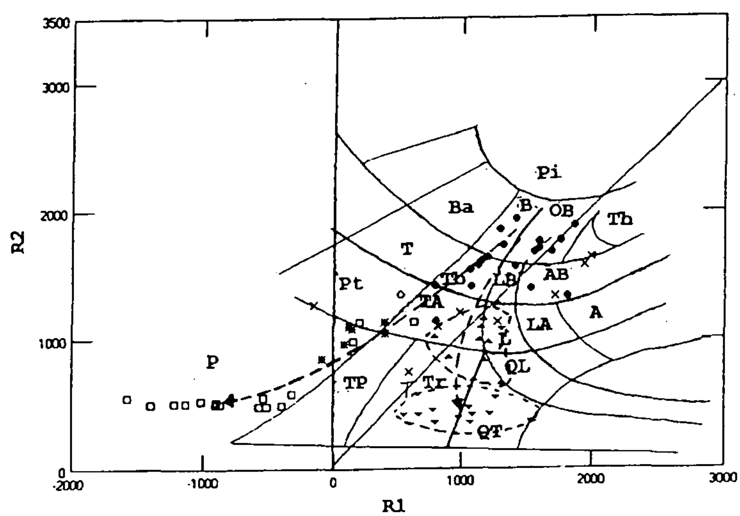

Fig. 6. The major element distribution of Early Cretaceous rock series of Mecsek Mts and the trachyandesite-trachyte rocks of Mórágy Hill and Ófalu Complex in the R1-R2 diagram (DE LA ROCHE et al. 1980). Arrow of dotted line shows the differentiation processes.
Legends are in the *Fig. 3*.

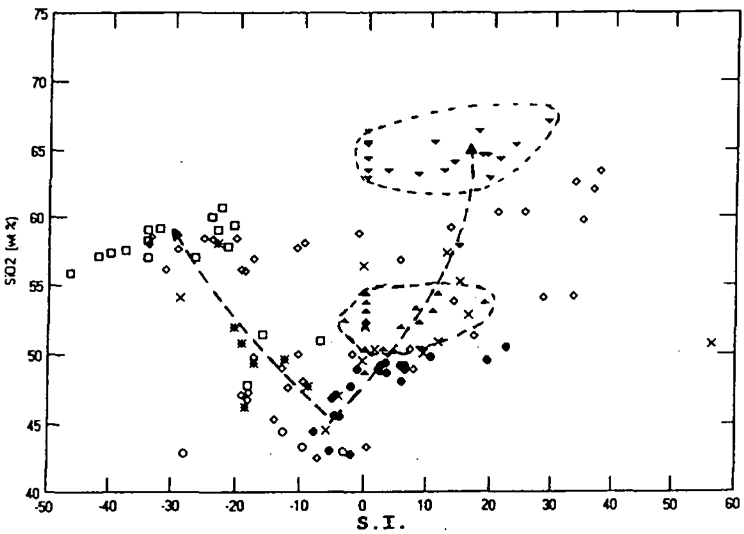

Fig. 7. The major element distribution of Early Cretaceous rock series of Mecsek Mts and the trachyandesite-trachyte rocks of Morágy Hill and Ófalu Complex in the S.I. diagram (FITTON 1991). Arrow of dotted line shows the differentiation process.
Legends are in the *Fig. 3.*

GENESIS OF TRACHYTE ROCKS

The reference literature shows several reason for the development of Q normative trachyte:

1. Partial melting of the crust origin rock during the subduction or collosion. Early Cretaceous magmatism of the Mecsek Mts it is impossible.

2. Special primer trachyte magmatism (LONGONOT, MACDONALD 1987). Early Cretaceous magmatism of the Mecsek Mts. it is impossible.

3. Bimodal volcanic activity (basalte-trachyte). It is characteristic in the rift of East African Rift System (BAKER et al. 1977, BAKER 1987, PRICE et al. 1985). Early Cretaceous magmatism of the Mecsek Mts. it isn't characteristic.

4. Crystal-liquid fractionation of slightly undersaturated rock series. It is a main and important process at the Early Cretaceous rock series of the Mecsek Mts. (BILIK 1983, DOBOSI 1985, HARANGI 1993).

5. Assimilal and fractional crystallization modell (AFC) (DEPAOLO 1981). It is possible at the last differentiated product (trachyte-phonolite) of the Early Cretaceous rock series of the Mecsek Mts. The slightly contamination are marked by the rel. high SiO_2, Th, Rb, Zr, Ce content and high negativ anomaly of Sr and Eu. Granitic grains and xenolits, trachytic, granitic breccia in the trachyte rocks are also may refer to the contamination. The AFC modell calculation is shown by Table 4. The more differentiated results of trachyte of Tillfarm are shown a slightly (r=0.2) granitic assimilation. The $^{87}Sr/^{86}Sr$ isotopic rates of tehse trachyte rocks (SVINGOR, KOVACH 1978) show an upper-crustal assimilation too: 0.72885±0.0043 (Mórágy); 0.7485±0.002 (Ófalu).

F: Mórágy, II/M1. r: 0.1

P. C.	F: 40	F: 35	F: 30	F: 25	F: 20	F: 15
La 41	106.1	121.4	141.6	169.8	211.8	281.2
Ce 82	218.9	251.4	294.8	355.6	446.6	598.3
Nd 45	82.3	89.7	99	111.3	128.2	153.8
Sm 8.86	17.35	19.07	21.25	24.12	28.14	34.27
Eu 2.99	2.22	2.13	2.03	1.92	1.79	1.63
Tb 1.02	2.11	2.33	2.63	3.02	3.58	4.45
Yb 1.93	5.2	5.97	7.0	8.44	10.6	14.18
Lu 0.27	0.69	0.79	0.92	1.1	1.36	1.8
TiO_2 4.08	0.41	0.29	0.2	0.13	0.08	0.05
Ta 3.3	7.55	8.46	9.64	11.22	13.5	17.08
Th 4.3	17.52	20.46	24.3	29.55	37.2	49.48

F: Tillfarm, III/T8 r: 0.2

P. C.	F: 40	F: 35	F: 30	F: 25	F: 20	F: 15
La 41	114	131.1	153.8	185.3	232.3	309.8
Ce 82	222.4	254.6	297.2	356.1	443	585.2
Nd 45	79.3	85.8	93.9	104.3	118.4	139.2
Sm 8.86	16.22	17.58	19.27	21.43	24.35	28.59
Eu 2.99	1.11	0.97	0.83	0.69	0.56	0.43
Tb 1.02	1.88	2.04	2.24	2.51	2.87	3.4
Yb 1.93	4.71	5.3	6.07	7.09	8.56	10.86
Lu 0.27	0.62	0.69	0.78	0.91	1.08	1.35
TiO_2 4.08	0.38	0.28	0.2	0.13	0.09	0.06
Ta 3.3	9.89	11.42	13.45	16.27	20.45	27.34
Th 4.3	27.32	32.4	39.02	48.04	61.12	82.03

LEGENDS

Primary Sample: basalte
92/3 (Márévári-valley);
P. C. (primary composition)

Contaminant: microgranite
B6 (Kismórágy)
Composition: La 40.8 Ce 85.9 Nd 25.2 Sm 8.8
Eu 0.5 Tb 0.7 Yb 2.5 Lu 0.33
TiO_2 0.39 Ta 5.5 Th 52.4

F: hybrid (contaminated) composition
r = rate of assimilation/frakcionation

Bulk distribution coefficients:
II/M1-D^{La}=0.03, D^{Ce}=0.002, D^{Nd}=0.349, D^{Sm}=0.312, D^{Eu}=1.21, D^{Tb}=0.237, D^{Yb}=0.009, D^{Lu}=0.055, D^{TiO2}=3.2, D^{Ta}=0.2, D^{Th}=0.13

III/T8-D^{La}=0.03, D^{Ce}=0.06, D^{Nd}=0.39, D^{Sm}=0.42, D^{Eu}=1.72, D^{Tb}=0.37, D^{Yb}=0.19, D^{Lu}=0.24, D^{TiO2}=2.95, D^{Ta}=0.04, D^{Th}=0.13

SUMMARING

A lot of unknown processes could modify further the composition of the primary melt: magma mixing; differentiation is caused by different density; differentiation of different deep (secondary magma chamber); contamination of granitic material. The Early Cretaceous trachytic rocks were generated by combined processes. Main process was the crystal-liquid fractionation and detained differentiation, but probably the low grade assimilation was also occur.

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Manuscript received 2 September, 1996