MELTING OF LAMPROPHYLLITE GROUP MINERALS: MELTING TEMPERATURE DEPENDENCE FROM COMPOSITION AND ELEMENT PARTITION BETWEEN LAMPROPHYLLITE AND MELT

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Lamprophyllite group minerals are important accessories in agpaitic derivates of alkaline massifs. The composition variations make them perspective for tipomorphyc study. But experimental data about they stability generally absent. The results for lamprophyllite-nepheline diagram are summered in another article in this volume [1]. The present paper is focused on the element behavior at the lamprophyllite crystallization processes.

We execute number of experiments to study their stability at high temperatures.

Starting materials were samples of natural lamprophyllite and barytolamprophyllite from Malourunsy, Lovozero and Khibina massifs (Russia), silica and synthetic nepheline $NaAlSiO_4$ glass. The charges composition is in table 1.

All experiments were carried out in platinum capsules by a cooling method. The duration was 5 - 360 hours. After experiments we studied material in immersion preparations and by electron microprobe analyse.

Table 1

Composition of charges, used in experiments

Шихта	Lam	Ne	X-Lam	M-Lam	13Lam:2Q	7Lam:1Ne	15Lam:8 Ne
SiO2	31.78	42.30	33.32	29.72	40.42	32.79	34.76
TiO2	29.49		23.99	28.55	25.76	26.66	21.12
Al2O3	0.17	35.89	0.24	0.23	0.14	3.59	10.30
FeO	2.15		4.33	3.26	1.88	1.94	1.54
MnO	4.02		0.89	2.23	3.51	3.64	2.88
MgO	0.63		1.14	0.39	0.55	0.57	0.45
CaO	0.87		1.09	1.29	0.76	0.79	0.63
SrO	15.05		6.42	6.57	13.15	13.61	10.78
BaO	1.05		13.88	16.15	0.91	0.94	0.75
Na2O	12.07	21.82	10.87	8.60	10.54	13.00	14.83
K2O	0.49		1.40	2.48	0.43	0.44	0.35
Nb2O5	0.21		0.12	0.07	0.18	0.19	0.15
F	2.05		2.50	1.04	1.79	1.86	1.47
Сумма	100.03		100.19	100.58			

We found that in all composition range lamprophyllite minerals melt incongruently. Sr-lamprophyllites meltting temperature is 860-870°C. Melting of lamprophyllite leads to formation of melt, nonstechiometric tausonite ($(Sr_{1-x}Na_x)TiO_{3-x/2}$), rutile ($TiO_2$) and freudenbergite ($Na_2Fe_{2-x}Ti_{6+x}O_{16}$) [1]. Ba-rich compositions melt at the lower temperature (see fig.1). There are melt, tausonite, titanate of iron and barium and two titanosilicits of strontium and barium among the products of their melting. One of the last may be close to the labuntsovite group minenals.

Correspondence between composition of lamprophyllite and melt is cited on the fig. 2. The Dawsons data for lamprophyllite and glass from Oldcombeite nephelenite (in black squeres) are on the same figure. It shows the good conformations between narural and experimental data.

The slope of the regression lines may be interpreted as estimation of partition coefficients between lamprophyllite and melt.

The coefficients show that lamprophyllite is poorer in potassium and iron that melt and richerman in magnium. The Ba/Sr ratio in lamprophyllite is less than in melt. It is in accordance with melting

temperature dependence on lamprophyllite composition and with usual in nature direction of lamprophyllite compositions evolution: from lamprophyllite to barytolamprophyllite.

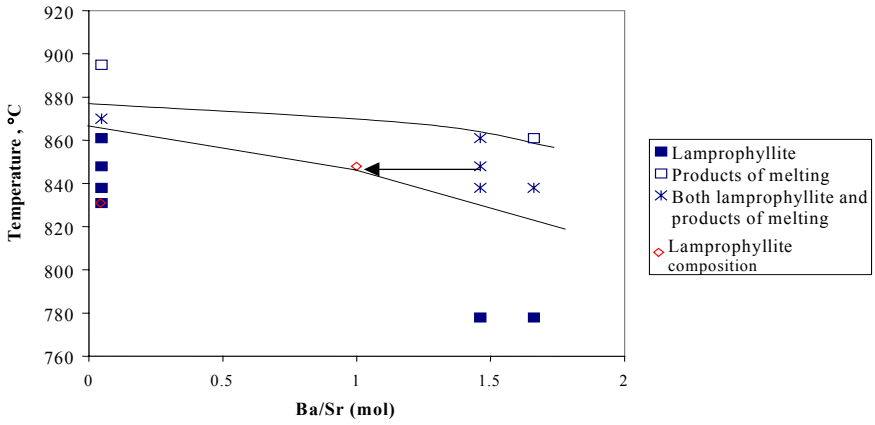

Fig. 1. Lamprophyllite melting temperature dependence from lamprophyllite composition

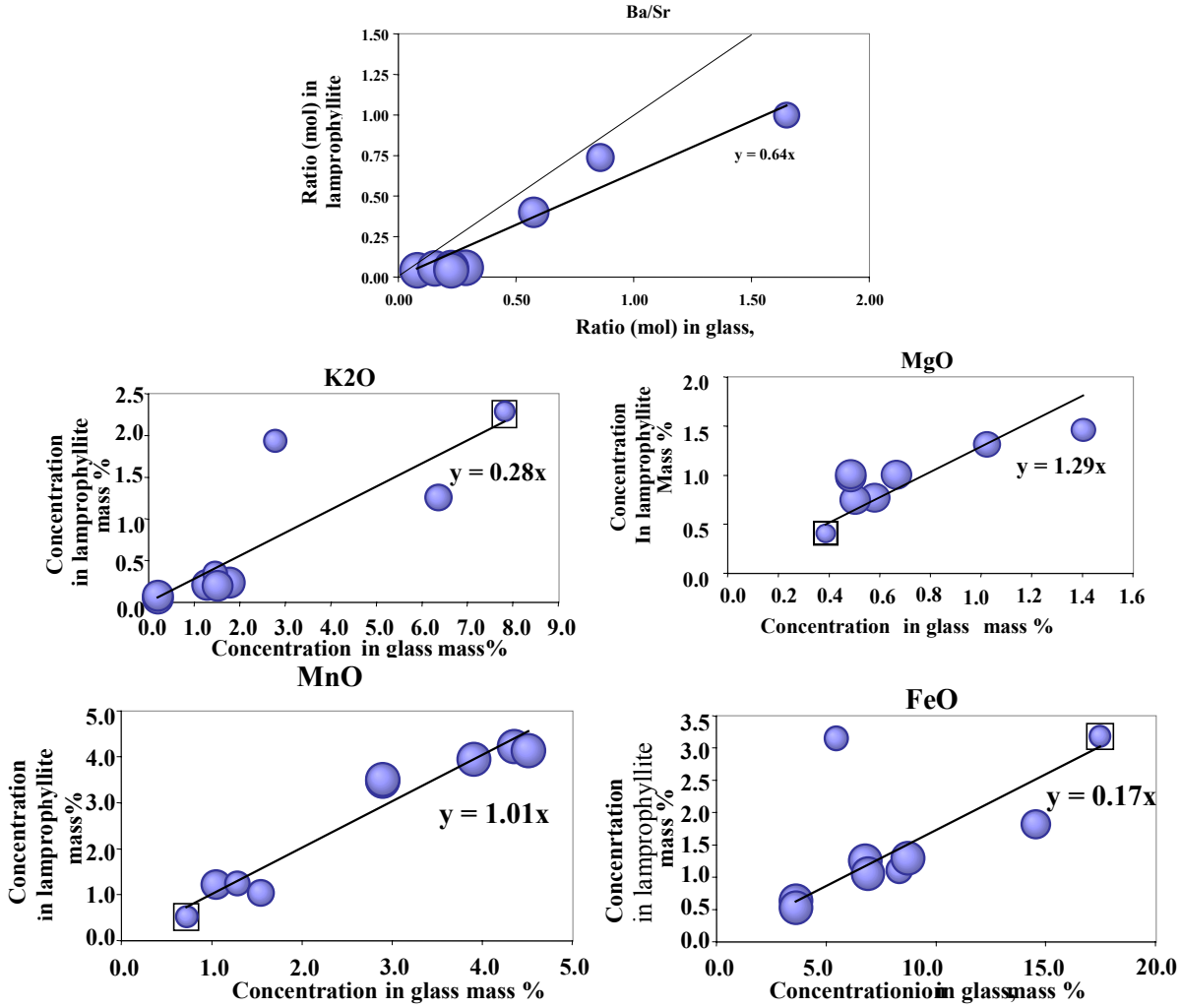

Fig. 2. Dedendense between lamprophyllite and glass composition. Size of ball show Sr/Ba ratio in lamprophyllite. In the black squeres the data for Oldonio Lengai [2].

References

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