

# THE DISTRIBUTION Rb, Sr, Ca DATA BETWEEN ALUMINASILICATE AND ALUMINIUMFLUORIDE MELTS

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The geochemistry of rare elements in passing from magmatic to postmagmatic stage is determined in many respects by their distribution between coexisted silicate (magma) and salt (fluid) melts. Salt melts are separated from magma by the liquid immiscibility mechanism because of the limited solubility of salts in magma.

The distribution of Rb, Sr, Ca and Cl in granite system with fluorine has been studied, the phase relations in the system at 800<sup>0</sup> C and P<sub>H<sub>2</sub>O</sub> = 1 κap are established earlier [1, 2, 3]. The experiments have been carried out in chosen Na, K-Na, Na-Li and K-Na-Li quartz normative and Na nepheline normative parts of the system Si-Al-Na-K-O-F.

Fluoride melt (Salt) is separated from the aluminosilicate one (Sil - matrix) in the forms of globules. Fluoride Sr or Ca-Sr phase were observed frequently in products of experiments. It "cements" salt globules or forms rims around them. Electron microscope investigations (image in reflected electrons) of Ca-Sr phase shows that it differs from salt phase by lighter colours and sometimes by presence of crystal faces. This phase undoubtedly is not quenched one, but there is no enough of data on its crystalline or liquid state in experiences. Its composition responds to a stoichiometry of fluorite: Ca<sub>0,72</sub>Sr<sub>0,21</sub>Na<sub>0,01</sub>F<sub>2</sub>. Fine allocations of Ca-Sr phase (up to 10 microns) are observed in globules in rare cases. The phase is observed seldom in experiments without Ca, it is met only as very thin rims around globules. The initial content Sr gets into an interval between concentration in matrix and globules in these cases.

The experiences have been carried in an exclave type-high pressure apparatus using a standard quenching technique. The accuracy of measurement of temperature is ±5<sup>0</sup>C, and of pressure is ±100 bars. Rubidium and strontium were introduced into the system as chlorides RbCl and SrCl<sub>2</sub>·6H<sub>2</sub>O, calcium - as wollastonite CaSiO<sub>3</sub>. The concentration of the introduced metals is 1 or 2 wt. %, and of Cl is 0, 4 or 0,8 wt. %. The contents of water is 4 wt. %. Phase structure of samples studied with the help of electron microscope CAMSCAN. The analysis of phases was spent on a microprobe CAMEBAX SX 50.

The results are submitted in the table 1.

**Table 1.**

**Partition coefficients of elements between silicate and salt melts ( $K_p = C_{el}^{Sil} / C_{el}^{Salt}$ ).**

In brackets there are introduced element contents (wt. %).

	Quartz normative part of system									Neph. norm. part
	KNa	Na		KLi		NaLi			NaKLi	Na
№ run	349	354	379	355	356	357	358	382	386	381
Rb	>9 (1)	>75 (2)	>25 (1)	>17 (1)	>56 (2)	>28 (1)	>71 (2)	≥26 (1)	>28 (1)	>21 (1)
Ca	<1 (1)	0,8 (2)	*	0,006 (1)	0,011 (2)	<0,003 (1)	<0,003 (2)	*	*	*
Sr	<0,06 (1)	<0,05 (2)	0,04 (1)	<0,02 (1)	<0,002 (2)	<0,003 (1)	<0,002 (2)	0,009 (1)	<0,003 (1)	0,22 (1)
Cl	>1 (0,4)	>6 (0,8)	>11 (0,4)	>9 (0,4)	4,13 (0,8)	3,86 (0,4)	3,11 (0,8)	2,68 (0,4)	8,5 (0,4)	>27 (0,4)
F	0,02	0,04	0,07	0,15	0,13	0,09	0,09	0,09	0,19	0,10

The note: \* - Ca in system was not introduced. The initial contents of fluorine in all experiments are about 13 mac. %. %.

The accordance of an element distribution to the Henry's law is confirmed for Rb in sodium (Na), for Ca - in potassium-lithium (K-Li), and for Cl - in sodium-lithium (Na-Li) parts of system. In many cases

Rb, Ca, Sr and Cl are distributed sharply in favour of one of phases, so their concentration in another phase is lower than a limit of definition. The partition coefficients are resulted as the smaller or larger quantity of the ratio  $C_{el}^{Sil} / C_{el}^{Salt}$ , numerator or denominator of which is equal to a limit of definition, correspondingly. Values of  $K_D$  for Ca and Sr are less reliable, than for other elements, because their most part leaves in appropriate Ca-Sr phases, and their concentration in a matrix and globules do not exceed parts per ten percent. The contents of Rb and Cl are usually less in comparison with introduced ones that it is possible to explain only by their entering into a fluid phase.

Rubidium concentrates in aluminosilicate melt in all parts of system. Contents in it are ten times more (it is probable, tens times), than in fluoride melt. Thus, taking into account our published data [2], a range of relative affinities of alkaline metals to fluoride melt is as follows:  $Li > Na > K > Rb$ . Calcium and strontium clearly concentrate in fluoride melt. The concentrations in both phases are more of definition limit for Na part of the system, and it is possible to compare their partition coefficients, which essentially decrease from nepheline normative to quartz normative parts of the system. The least value  $K_D$  is in lithium - bearing part. The data on barium [3] show, that its affinity to fluoride melt is lower in Na part of system, i.e. the regularity for alkaline-earth elements is essentially the same, as for alkaline one. Partition coefficients of Ca and Sr is tens and hundreds times less in lithium containing compositions as well as for many other elements.

Rb concentrates in aluminosilicate, and Sr - in fluoride melt. The opposite behaviour Rb and Sr had to result an essential increase of the ratio Rb / Sr in magma after separation of the fluoride liquid. The ratio is used as «a geochemical indicator».

The chlorine concentration in silicate melt is some times higher, than in coexisting fluoride one, the dependence on composition of the system is doubtful yet.

The distribution of fluorine confirms with earlier received regularities.

## References

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