CHLORIDE SOLUBILITY IN MAGMATIC MELTS FROM 0.1 TO 3.0 KBAR: INFLUENCE OF Ca, Mg, Na, K, Sr, Ba CONTENTS IN THE MELT COMPOSITION

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Experiments were performed at T - 1250 ^{o}C, in range of pressure from 100 up to 3000 bar for 4 days using an internally heated gas pressure vessel. The thoroughly mixed and finely grinded mixture of aluminosilicate minerals, and Na, Ca, K chlorides was inserted into a platinum capsule together with the distillate water. The mineral/chloride/water ratio was about ~70% / ~20% / ~10%.

After the runs the transparent aluminosilicate glass and separated chloride phase were obtained. The more light chloride phase was usually located in upper part of capsule. As a rule, the aluminosilicate crystals were absent into quench magmatic glass. The composition of quench aluminosilicate glass was analyzed using a “Camebax” microprobe.

Twelve “model” compositions of mineral-chloride mixtures were selected for our experiments. Using selected composition, we wanted clearly to define the influence of separate elements content into magmatic melt on the chloride solubility. Four-component aluminosilicate compositions were selected. SiO_2 and Al_2O_3 contents were close to constant, and two other components contents (for example, Na and Ca, Na and Mg, Na and Sr, Na and Ba) were varied. Besides three- component aluminosilicate compositions close to albite and orthoclase were used.

The selected compositions were close to subaluminous melt: Mol $Al_2O_3/(CaO+Na_2O+K_2O)$ ~1. Three metaluminous (Mol $Al_2O_3/(CaO+Na_2O+K_2O)$ <1) melts, namely Ca-basalt and two syenite melts were the exclusions. By C.I.P.W. classification the selected melts model the dacites, syenites and alkaline basalts.

The obtained results are partially showed on figures 1-3.

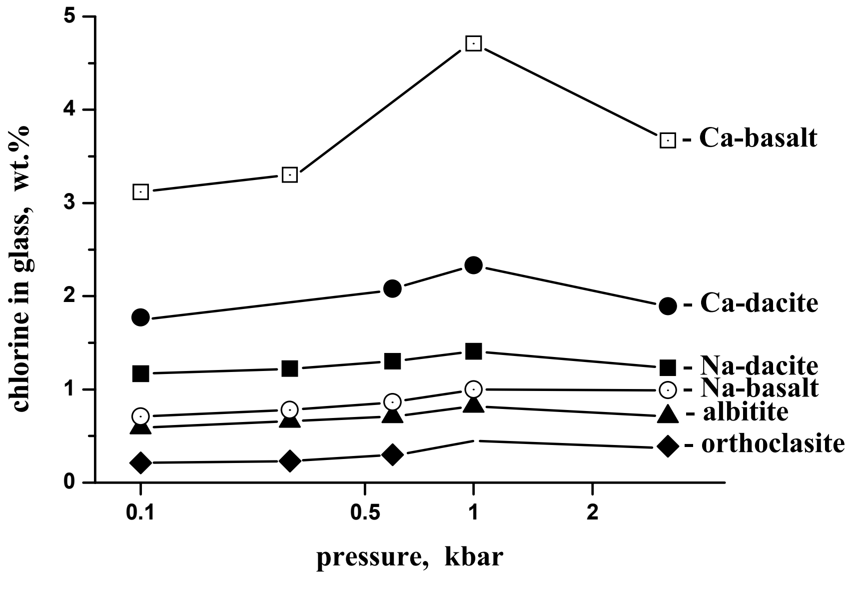

Fig. 1. The dependence of chlorine content in model magmatic melts from the melt composition and the pressure in range from 0.1 up to 3.0 kbar.

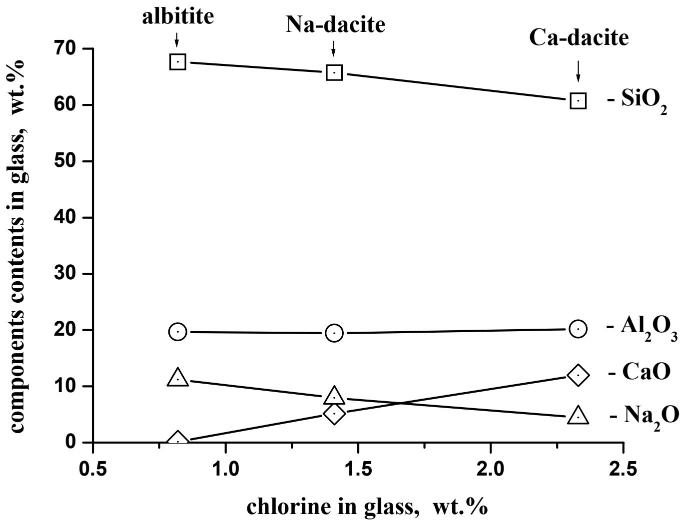

Fig. 2. The dependence of chlorine solubility in the melts from composition of two dacite melts and albitite melt at P =1 kbar.

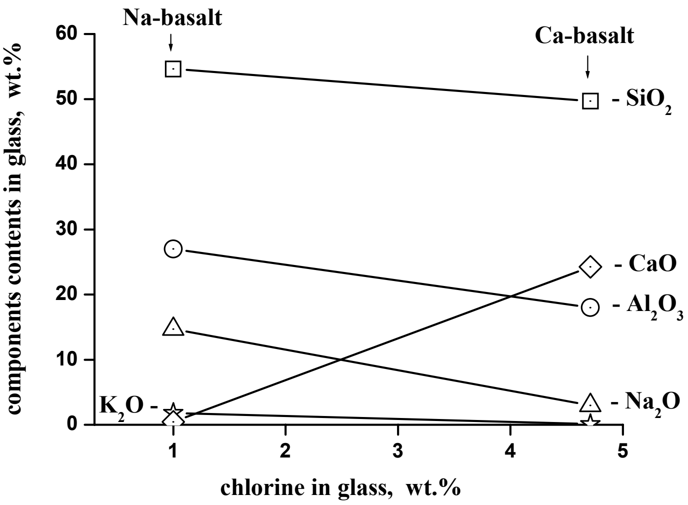

Fig. 3. The dependence of chlorine solubility in the melts from composition of two basalt melts at P =1 kbar.

Conclusions

1. Chlorine content into used model melts is varied in very wide range from 0.2 up to 4.7 wt.%.
2. Magmatic melt composition influence essentially on chlorine solubility into this melt. So at the same P-T conditions chlorine content in Ca-basalt melt was in 10-15 times higher than into orthoclase melt. While chlorine contents are varied much less (maximum in 1.5-2 times) at variations of pressure from 100 to 3000 bar and at the same melt composition.
3. Maximum of chlorine solubility is defined in studied range of pressure for large part of used melt compositions. It is about near 1 kbar. By literature data with increasing pressure the chlorine solubility into the melt has a minimal value about at 5-6 kbar.
4. The contents of bivalent alkaline earth elements promote higher chlorine solubility into the melt as compared with the contents of monovalent alkaline elements. Bivalent elements form the row: Ca, Mg, Sr, Ba, so Ca-rich melts solve the maximal quantity of Cl, and Ba-rich melts solve the minimal quantity of that. The content of Na of alkaline elements promotes higher chlorine solubility into the melt as compared with the contents of K. The orthoclasite melt contents minimal quantity of Cl among all used melts. The content of Cl into albitite melt is approximately in 2 times higher than into orthoclasite melt.