Geophysical Research Abstracts
Vol. 17, EGU2015-2779, 2015
EGU General Assembly 2015

New data about the reasons of periodic sulfide crystallization-dissipation in ultrabasic magmas.

Alex Asavin and Alex Ariskin

Vernadsky Institute of Geochemistry and Analitical Chemistry RAS, geochemistry, Moscow, Russian Federation (aalex06@inbox.ru)

Possible manifestation of sulfide mineralization in the intrusive complexes of basic and ultrabasic rocks depends on the two main factors: sulphide liquid immisiblity and segregation (concentration) of sulfide minerals as crystallization primary and derived magmas. One of the news models in order to calculate the saturation concentration of sulfur basic and ultrabasic melts proposed in the (program SULSAT [Ariskin et.al., 2013]). In this model, the first time takes into account the effect of nickel on the solubility and the composition of the sulfide phase with variable composition (FeS-NiS). Thanks to the detailed evaluation of our conditions of crystallization of olivine and spinel meimechite and picritic melts [Asavin 2014]. an opportunity to assess the value SCSS (Sulfur Content at Sulfide Saturation) from model SULSAT mantle melts in the ultrabasic magma camera. We obtained, the large statistical material on the distribution of sulfur in the samples groundmass and in the bulk rocks, we can reliably assess the level of actual sulfur content in natural melts (Tabl1-2). According theoretical model we calculated SCSS in natural volcanic melts - meimechites and picrites (lava and dyke Maimecha-Kotuy province Siberia [Asavin 2014]).

Tabl.1 Calculation for meimechite samples.

Sample.	T(C)	-Log fO_2	#S (wt%)	S6+/#S	SiO_2	MgO	CaO	Na_2O	K_2O	NiO	S (ppm)
251_2	1514	4.59	0.43	0.40	41.96	25	9.23	0.16	0.7	0.14	237
251_2	1510	4.62	0.48	0.42	39.93	22.93	7.13	0.24	0.87	0.12	270
50C	1340	6.09	0.31	0.29	40.76	15.01	14.63	0.35	0.4	0.32	
8313	1475	4.9	0.32	0.28	42.56	21.78	11.4	0.3	0.23	0.10	139
85_19	1466	4.97	0.40	0.39	42.04	21.06	9.65	0.44	1.31	0.07	139
85_22	1481	4.85	0.40	0.41	41.44	22.13	10.14	0.44	1.28	0.10	539
85_27	1498	4.72	0.73	0.51	41.1	23.33	2.56	0.76	1.01	0.24	1120
85_38	1580	4.09	0.51	0.41	38.17	27.09	6.1	0.1	0.2	0.15	197
85_38	1588	4.03	0.50	0.41	41.07	29.93	6.74	0.1	0.22	0.15	291
195	1471	4.93	0.37	0.30	39.2	19.7	7.38	0.4	0.59	0.17	661
195	1525	4.5	0.41	0.34	41.42	25	9.04	0.47	0.4	0.20	700
199	1569	4.17	0.48	0.43	40.36	26.33	5.22	0.19	1	0.19	491
201	1517	4.57	0.45	0.40	39.05	23.27	8.59	0.16	0.83	0.00	194
202	1520	4.54	0.33	0.39	38.84	23.62	10.86	0.26	0.76	0.09	192
202	1495	4.74	0.44	0.55	40.92	21.32	9.44	0.71	4.75	0.09	177
204	1447	5.13	0.46	0.46	41.16	20.44	8.99	1.05	1.08	0.17	316
204	1588	4.03	0.48	0.46	39.52	27.55	5.69	0.5	0.74	0.19	500
207	1627	3.76	0.40	0.45	40.74	30.71	4.85	0.57	0.27	0.19	998
209	1680	3.4	0.48	0.49	37.8	32.68	4.64	0.91	0.08	0.23	340
215	1544	4.36	0.38	0.41	39.38	24.78	8.38	0.31	0.78	0.20	891
215	1603	3.93	0.44	0.42	40.18	30.12	7.65	0.22	0.5	0.20	897
87_216	1457	5.05	0.53	0.52	39.48	19.97	8	1.46	1.86	0.21	300

We observe higher and wide interval temperatures of natural ultrabasic melts (1250-1600 ^{o}[U+FFFD] leaded to high value of the SCSS and great variation SCSS in natural magma (about 3 times). With fluctuations in the melt oxidation conditions seems connected by large variations in the value of natural SCSS in ultrabasic magmas. Interval values for picrite 0.25-0.4, and for meimechite 0.3-0.8.

Tabl.2. Calculation for picrite samples.

Sample.	T(C)	-Log fO_2	#S (wt%)	S6+/#S	SiO_2	MgO	CaO	Na_2O	K_2O	NiO	S (ppm)
7865	1403	5.79	0.26	0.23	41.83	17.81	14.85	0.24	2.27	0.02	
85_43	1311	6.64	0.31	0.27	40.72	12.22	14.13	1.95	1.69	0.04	129
85_47	1391	5.9	0.35	0.30	41.85	16.90	11.73	0.24	2.91	0.05	285
223	1348	6.29	0.30	0.26	40.56	14.48	14.42	0.73	2.14	0.06	600
224	1537	4.71	0.36	0.38	39.83	25.49	10.50	1.00	1.50	0.07	300
872_27	1375	6.04	0.30	0.31	38.58	14.60	11.41	0.29	3.08	0.32	
9612	1403	5.79	0.25	0.23	38.75	16.50	13.76	0.24	2.10	0.10	260
9765	1430	5.56	0.34	0.48	40.16	17.57	11.38	1.55	3.35	0.12	870
9771	1484	5.12	0.42	0.52	38.03	19.62	8.00	3.35	3.10	0.07	750

We observed strong dependence SCSS from temperature [Ariskin et al., 2013]. In interval 1450-1500 (50 degree) the sulfide saturation value change about 1.5-3 times in picrite and 1.5-2 in meimechites.

One of the famous result of our observation is the calculation ratio S^{6+}/S total in the natural magma by the model Jugo [Jugo 2009].Due to the high oxidation potential of these melts (+0.5-0.8 QFM) high proportion of sulfate sulfur relatively sulfide (40-50%) in our calculations. With the decrease in temperature of the melt fraction of sulfate sulfur falls.

We believed that that variation SCSS can be reason a fast occurrence of a sulphide liquid (immiscibility liquid) and its fast disappearance into silicate magma.

Segregational heterogeneity in that unstable condition in magma storage, especially if new portion of fresh melt intruding will be available, can be forms inner layers cumulus with and withou sulfide minerals in magmatic camera.

Reference

Asavin A.M. Relationship between in ultrabasic vulcanite – meimechite and picrite by the geothermometric data of the olivine-melt equilibrium.// Experiment in Geosciences-2014 v2, P.191-199

Ariskin A. A., L. V. Danyushevsky, K. A. Bychkov, A. W. Mcneill, G. S. Barmina, and G. S. Nikolae. (2013). Modeling Solubility of Fe-Ni Sulfides in Basaltic Magmas: The Effect of Nickel *Economic Geology,* V. 108, pp. 1983–2003

Jugo, P.J. (2009). Sulfur content at sulfide saturation in oxidized magmas: *Geology,* V. 37, p. 415-418.