OLIVINES FROM "OBNAZHENNAY" PIPE, KIMBERLITE PROVINCE OF YAKUTIA. THE EXPERIMENTAL DETERMINATION OF THE INTRINSIC OXYGEN FUGACITY

Zharkova E.V., Kadik A.A. (GEOKHI RAS)
kadik@geokhi.ru; fax: (495) 938-20-54; phone: (499) 137-72-00

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We took 10 samples of olivines from different deep xenoliths found out in kimberlite pipe "Obnazhennay" from kimberlite province of Yakutia. The pipe is not diamond-bearing, but very well known thanks to abundance variety and freshness of deep xenoliths [1]. The olivines that we chose for the investigation can be divided in two groups: garnet-bearing peridotites and peridotites without garnets. The determinations were carried out on high temperature furnace based on two solid electrolytes at temperature interval from 750°C to 1100°C and normal pressure. The accuracy of measurements of temperature is ±2°C, and the intrinsic oxygen fugacity ±0.2 log fO_2. The description of the samples and the results of the experiments are in the tab. 1 and on figs 1 – 5. Microprobe analysis is given in the tab. 2 (part 1 and 2).

Table 1

The values of coefficients A and B in the equation of log fO_2 = A-B/T°, K for Ol from deep xenoliths from kimberlite pipe "Obnazhennay"

Samples	Rock	A	B	R	n
Ob-24	Peridotite without garnet "large grain family"	11.399	32628.7	0.998	8
Ob-16	Peridotite without garnet "small grain family"	21.205	43741.3	0.999	9
Ob-73		26.406	48551.,6	0.995	9
Ob-301	Lherzolith "large grain family" at the bbeginning stage garnitization, serpentinization is poor				
	1. border of tumour,	15.234	36580.9	0.997	9
	2. center of tumour.	13.792	34878.8	0.998	10
Ob-62	Garnet lherzolith High magnesian	14.697	36451.4	0.994	9
Ob-312	High magnesian	18.08	40047.8	0.998	9
Ob-152	ferro-magnesian	17.003	38167.4	0.994	8
Ob-158	Garnet pyroxenite High ferro-magnesian chromium, amphibolized	17.970	39760.8	0.996	9
Ob-65	Ilmenite keeping Micaceous garnet peridotites (harzburgite)	17.339	39238.2	0.996	9
Ob-93		13.721	35752.0	0.995	9

R – coefficient of correlation; n – the number of experimental points

Table 2 (part 1)

Microprobe analysis of the olivines from kimberlite pipe "Obnazhennay"

Oxides	Ob-24	Ob-16	Ob-73	Ob-301 border	Ob-301 centre
MgO	50.29	49.34	49.83	48.50	48.86
SiO_2	41.82	41.26	42.04	41.78	41.78
FeO	7.24	9.63	8.43	7.72	7.97
NiO	0.35	0.30	0.32	0.44	0.40
Cr_2O_3	0.03	0.01	0.03	0.15	0.17
V_2O_5	0.01	0.00	0.01	0.02	0.00
MnO	0.01	0.19	0.13	0.13	0.08
TiO_2	-	0.03	0.00	0.00	0.00
Sum	99.85	100.75	100.80	98.73	99.26
Fo	92.10	89.68	90.91	91.27	91.17
Fa	7.90	10.32	9.09	8.73	8.83

Table 2 (part 2)

Microprobe analysis of the olivines from kimberlite pipe “Obnazhennay”

Oxides	Ob-62	Ob-312	Ob-152	Ob-158	Ob-65 [1]	Ob-93
MgO	50.87	50.61	50.37	49.46	46.33	43.25
SiO_2	40.95	41.55	41.52	41.44	40.45	38.80
FeO	7.56	7.24	7.64	8.75	13.46	17.94
NiO	0.29	0.31	0.42	0.23	0.23	0.06
Cr_2O_3	0.00	0.04	0.01	0.00	0.01	0.00
V_2O_5	0.00	0.03	0.06	0.01	-	-00
MnO	0.12	0.14	0.14	0.17	0.12	0.15
TiO_2	0.02	0.02	-	0.02	-	0.08
Sum	99.81	99.94	100.17	100.08	100.79	100.28
Fo	91.93	92.15	91.64	90.59	-	80.93
Fa	8.07	7.85	8.36	9.41	-	19.07

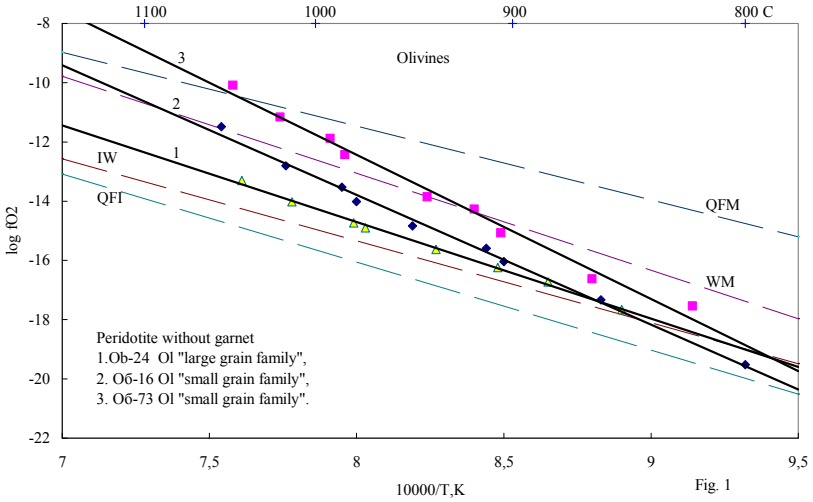

Fig.1.

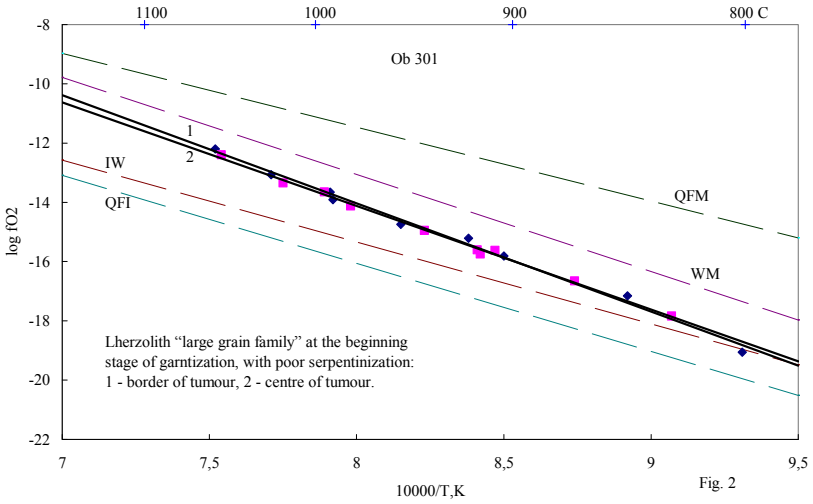

Fig.2.

We determined during the experiments that the intrinsic oxygen fugacity for the olivines from peridotite without garnet from “small grain family” has fO_2 higher (fig. 2) then the olivines from peridotite without garnet from “large grain family” and has intrinsic oxygen fugacity lower about 2.0-2.5 log unit at temperature 1050°C and lies in the field just higher then buffer IW.

It should also note, that intrinsic oxygen fugacity for the olivine from the sample Ob 301 taken from center or from the border of the tumor (fig. 3) has equally fO_2 and lies in the field between buffer equilibrium IW –WM. Intrinsic oxygen fugacity for olivines from garnet-bearing and ilmenite-bearing xenoliths lies also in the field between buffer equilibrium IW-WM (fig. 3-5).

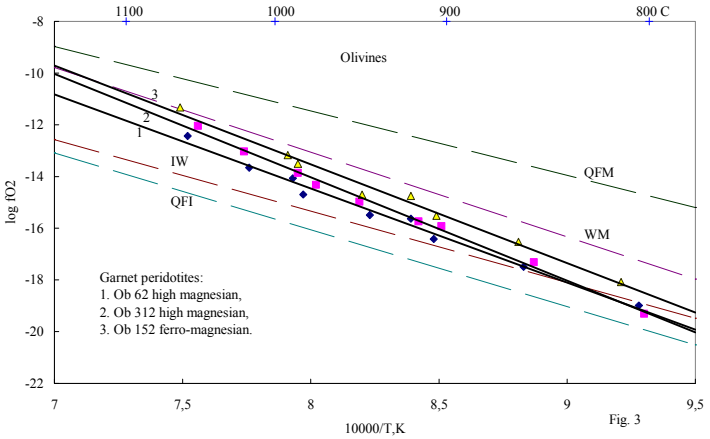

Fig.3.

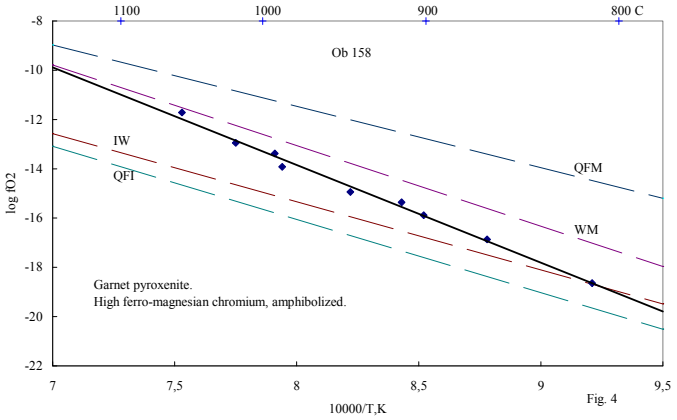

Fig.4.

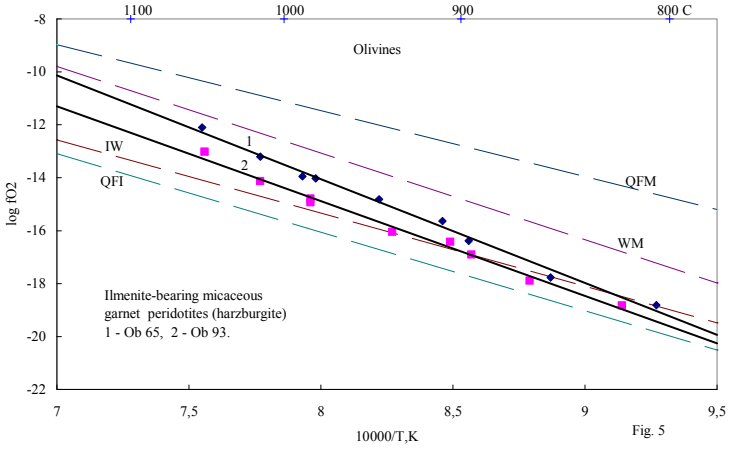

Fig.5.

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Reference

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