ILMENITES FROM KIMBERLITE PROVINCE OF YAKUTIA: THE EXPERIMENTAL DETERMINATION OF THE INTRINSIC OXYGEN FUGACITY

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The intrinsic oxygen fugacity (fO_2) is one of the most important characteristic of the thermodynamical condition of the upper mantle. The estimation of the intrinsic oxygen fugacity which typical to deep redox reactions is very important problem. The solution of this problem can be achieved by two ways: 1- thermodynamic analyses of the minerals equations, and 2-direct determination of the intrinsic oxygen fugacity.

We took seven samples of ilmenites (the collection of Genshaft Y.S.) from kimberlite province of Yakutia for our investigation. The experiments of determination of intrinsic oxygen fugacity were carried out on high temperature furnace based on two solid electrolytes. The temperature interval was from 800°C till 1100°C and at 1 atmosphere. Gas mixture was $CO_2 + H_2$. The precision of temperature measurement was ±2°C and the precision of log fO_2 was ±0.2 log fO_2. The description of the samples and the results of the experiments are in the table.

Table

	Sample	A	B	r	n
Ilm-811	Daldinskoe field, Udachnaya-west pipe	34,073	57469,2	0,986	9
Ilm-836	Daldinskoe field, Udachnaya-east pipe	43,421	67214,7	0,989	9
Ilm-1142	Daldinskoe field, Zarnica pipe	21,700	43795,7	0,990	8
Ilm-782	Daldinskoe field, Dalnaya pipe, schurf 52	25,075	48272,6	0,985	8
Ilm-792	East Ukukitskoe field, Kubanskay pipe	12,832	32093,2	0,990	8
Ilm-539	Merchimdenskoe fiel, Operatorskay south pipe	21,529	41860,9	0,983	6
Ilm-543	Merchimdenskoe fiel, Operatorskay north pipe	14,580	32924,2	0,980	9

The results of the experiments describes by linear dependence log $fO_2 = A - B/T°K$ (table, where "r"- correlation coefficient, and "n"- the quantity of experimental points).

The results of the experiments show that intrinsic oxygen fugacity for the most ilmenites are between WM and QFM buffer equilibrium at 800°C-1050°C. The fO_2 for the ilmenites from the Udachnaya pipe lay in the field of QFI at 800°C and in the field of QFM at 1050°C. This experimental result is in a good agreement with the theoretical calculations carried out by Y.S.Genshaft and A.Ya.Saltikovskii (fig.1).

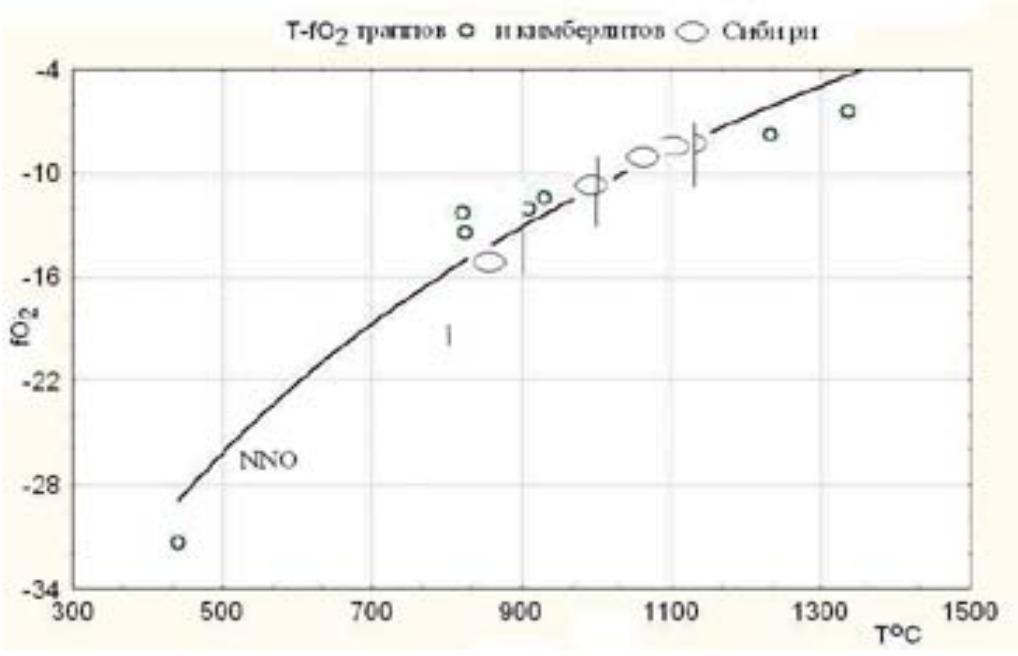

Fig.1.

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