STUDY OF OXYGEN FUGACITY INFLUENCE ON REDOX STATE OF IRON IN GRANITOIDIC MELTS

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Room temperature ^{57}Fe Mössbauer spectroscopy has been used to investigate the structural and oxidation state of iron in quenched glasses. Samples were produced in set of melting experiments at 1120 to 1420 ºC and oxygen fugacities of $10^{-0.7}$ (air) to 10^{-13} (IW buffer) bars. Two compositions were investigated: 1) granitic; 2) pantelleritic (alkali granitoid). Samples were melted in vertical muffle tube under controlled oxygen fugacity and then quenched in water. Alumina crucibles were used as a container for powdered rock samples.

Microprobe analysis has shown that chemical composition changes with temperature increasing (in particular, Na content decreases). It is essential to note that dashed lines, which are related to higher temperatures, correspond to glasses with slightly different chemical compositions.

Mössbauer spectra were recorded under room temperature in absorption geometry. They have a characteristic form of asymmetrical broad doublets and were processed by means of calculation of two independent hyperfine parameters distribution function.

Data analysis has shown that at the given temperature redox state of iron is described by the linear dependence: $\lg (Fe^{3+}/Fe^{2+}) = a \cdot \lg(fO_2) + b$ (fig. 1). It is noticeable at the figure that in general redox ratio Fe^{3+}/Fe^{2+} under given values of T and fO_2 in more alkaline pantelleritic melt is larger than in granitic melt. It is also should be noted that the ratio decreases with temperature increasing under constant oxygen fugacity.

Ferric ions coordination transition from octahedral to tetrahedral sites was revealed. The transition occurs with increasing of iron oxidation degree (starting from ratio $Fe^{3+}/\Sigma Fe>0.6$). At the same time ferrous ions are not subjected to significant coordination change.

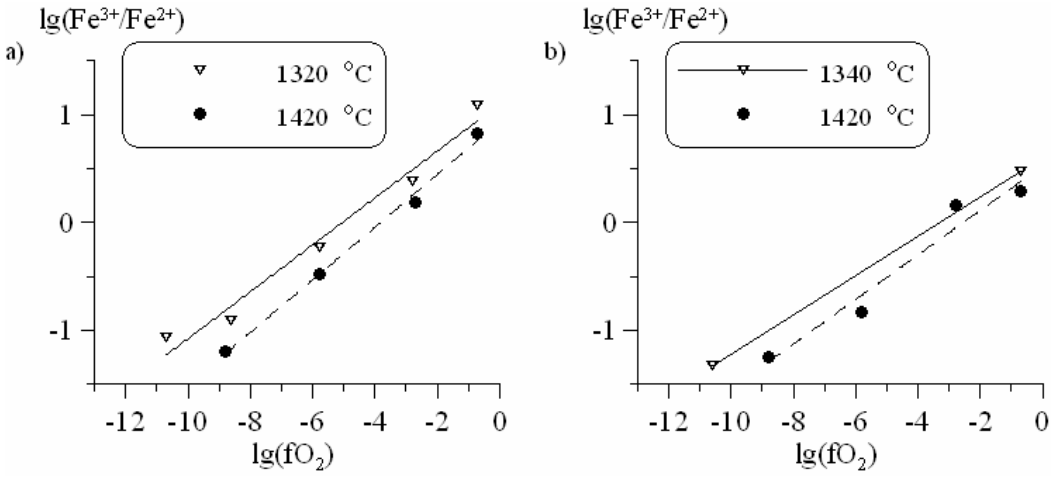

Fig. 1. Dependence of Fe^{3+} fraction on oxygen fugasity (approximation lines: straight line - 1320ºC (1340ºC), dashed line - 1420ºC): a) pantellerite, b) granite composition

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