EVIDENCE FOR MASS TRANSFER AT THE CONTACT OF GARNET GLAUCOPHANITE AND QUARTZ-GARNET-OMPHACITE ROCK IN THE MAKSYUTOV COMPLEX, SOUTH URALS

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The contact of garnet glaucophanite and quartz-garnet-omphacite rock from the Maksyutov Complex (South Urals) was studied in detail. The distribution profiles of SiO_2, MgO and FeO_{tot} contents in rocks and FeO, MgO and CaO contents in garnet rims depending on the distance from the contact suggest the diffusion migration of chemical components across the boundary. They are described by the equation of linear diffusion at the contacts of two semi-infinite media ($x < 0$, $x > 0$) with stepwise initial distribution of concentrations. The values of C_1, C_2, D_1t and D_2t were calculated by least-squares method for the two models, i.e. when (a) $D_1 = D_2$ and (b) $D_1 \neq D_2$. The points of inflection in the concentration sigmoidal profiles calculated for the first model are noted away from the contact. This suggests that the observed boundary was displaced by 3.2 cm from its initial position towards garnet glaucophanite. The mass transfer scales at the contact of garnet glaucophanite and quartz-garnet-omphacite rock were estimated to be 4.5 to 13.7 cm for different components for the first model and 6.9 to 14.3 cm for the second model. Based on the calculated values of the reaction zone thickness and effective diffusion coefficients, a series of differential mobility of components is outlined. It was shown that the most mobile components are CaO and MgO, and the least mobile components are SiO_2 and FeO_{tot}. The volumes of local equilibrium near the contact of garnet glaucophanite and quartz-garnet-omphacite rock are estimated to be less than 1 mm^3 The differences of FeO, MgO and CaO contents in rims of garnet grains located at the distance of 1 mm, reach 3-5 wt%. Based on the study of zoned garnets, the duration of the thermal event should be less than 1 - 5 Ma. The calculated values of effective diffusion coefficients in the investigated rocks are $10^{-14} - 10^{-15}$ cm^2 / s or even less.

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