



Dynamics of mantle rock metasomatic transformation in permeable lithospheric zones beneath Siberian craton

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The numerical descriptions of hydrodynamic model of two – velocity heat and mass transfer in permeable zones above the asthenospheric lenses was formulated and solved basing on the study the composition of inclusions in minerals of low crust ultra metamorphic rocks and lithospheric mantle metasomatites and estimation of thermodynamic conditions of the processes. Experimental study of influence of the simulated hot reduced gas flows on the minerals of low crust and mantle xenolith of the Siberian craton platform (SP) give the basic information for this processes. In detail:

1. Thermobarometric study of composition of inclusions in granulite and lithospheric mantle rocks beneath the diamondiferous cratons allowed to estimate the gas phase compositions during the metamorphism and metasomatism as well as products of their re equilibration during decompression.
2. Results of the pilot study of the influence of hot gas impact flows on minerals of mantle xenoliths are taken into account. This allowed to reproduce the elements and heterophase kinetics of interactions within a temperature range of about 300 to 1300o on relative to the interactions between the solid, liquid and gas phases.
3. Correct mathematical two-velocities model of fluid dynamics for compressible multiphase fluid -rock systems.
4. Numerical schemes are simulated and solved for the problems of quantitative description of 2D dynamics behavior of P and T within the permeable zone above the asthenospheric lens.

5. Quantitative description of heterophase non isothermal fluid-rock interaction within the framework of the approximation was obtained on the basis of the parallel solutions of the exchange between the ideal gas flow and solid phase according to the model of multi-reservoir reactors based on minimization of the Gibbs potential. Qualitatively the results of numerical simulation are as follows:

- 1) appearance in permeable zones of the any composition fluid flows from the upper mantle magma chambers inevitably causes the formation of the faults in ultrabasic lithospheric mantle and creation of zonal metasomatic columns,
- 2) input of the major silicate components to the depleted ultrabasic lithospheric mantle transform them to substrates, which can be attributed to deep seated analogs rodingites, or developing of granatites within the original matrix
- 3) input of any carbon bearing combinations of fluid follows to the deep carbonation of metasomatic substrate
- 4 above the marked zones the regenerated pyroxenite zone appears, followed by phlogopitization and amphibolization,
- 5) evaluation of heat-mass transfer according to the two-velocity hydrodynamics showed that Darcy approximation Apparently brings to the overestimation of the the rate of thermal wave development during the convective warming up underestimation of the pressure in the fluid stream.

It is shown that gneissosity, previously considered to be eclogites are the legitimate metasomatic rock associations appearing in permeable zones of lithospheric mantle above the magmatic chambers