MINERALOGICAL COMPOSITION DEEP-SEATED PARAGENESIS AND PHASE DIAGRAMS MODEL OF ALUMINA-SILICA SYSTEMS

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Problems of genesis deep rocks and their classifications have a common basis. The solution of these problems are in the experimental researches. The most popular model for experimental researches of genesis deep rocks is the system CaO-MgO-Al_2O_3-SiO_2. The choice of this system as a quality of experimentally models is connected to sufficient proximity of composition of this system and deep paragenesis.

The volume of compositions of the system CaO-MgO-Al_2O_3-SiO_2 it is possible conditionally to devide on three parts of compositions: forsterite, quartz and alumina. The greatest interest for petrology represents forsterite part of a system CaO-MgO-Al_2O_3-SiO_2 [1]. A basic component of this volume of the phase diagram is a nonvariant equilibrium (Cpx, Opx,Gr, Fo, An, Sp), from point of this equilibrium at high temperatures go out the rays monovariant equilibrium: An+Fo=Cpx+Opx+Sp, Opx+An+Sp= =Cpx+Gr, Sp+Opx+Cpx=Gr+Fo, [1-3].

In the region of low pressure the association An+Fo is stability, which phase composition corresponds paragenesis of rocks low pressure facies of basic and ultra basic composition, a type gabbros and et. el.. At more higher pressure from reaction An+Fo=Cpx+Opx+Sp up to a reaction Sp+Opx+Cpx=Gr+Fo, the associations Sp+Opx+Cpx+Fo, Sp+Opx+Cpx+An are stability, which appropriate on the set of phases paragenesis spinel lherzolite and spinel-fieldspatoid pyroxenite. The formation of a pair clinopyroxene garnet becomes possible at pressure above from a reaction Opx+An+Sp=Cpx+Gr and there is a steady of lot clinopyroxene-garnet associations appropriate deep paragenesis. Let's mark, that direct transition gabbro in eclogite does not exist. The special interest is represented by association Opx+Cpx+Gr. In a system CaO-MgO-Al_2O_3-SiO_2 it is divariant. Together with these three phases can coexist both spinel, forsterite, quartz (coesite) or kyanite (sillimanite). Each four phases will form extensive volume of compositions, which can be compared to some types deep paragenesis. So the association Opx+Cpx+Gr+Sp corresponds spinel-garnet pyroxenite, for associations Opx+Cpx+Gr+Qz(Co) and Opx+Cpx+Gr+Ky of analogs natural paragenesis is not met, and association Opx+Cpx+Gr+Fo corresponds paragenesis garnet lherzolite, and different types garnet pyroxenite. Last paragenesis it is accepted to share on an amount of minerals, in particular olivine. However of physical-chemical point of view this division is not meaningful. It is one type of rocks. Typomorphy indication of this type paragenesis is content calcium in garnet, which is practically constant in all stability interval of this association [4] and state 12-16 mol.% grossular component.

At pressure higher from a ray of the reaction Sp+Opx+Cpx=Gr+Fo the interesting divariant association Sp+Cpx+Gr+Fo is stability, it can be considered as simple analog of the paragenesis garnet verlite. Peculiarity of this association is the growth a content grossularite component in garnet with increase of pressure [3], that corresponds to peculiarity of composition garnet in paragenesis garnet verlites.

In a liquidus of forsterite part of a system CaO-MgO-Al_2O_3-SiO_2 there two series of monovariant eutectic melts reactions are present. The first series is submitted by reactions: L=Fo+Opx+Cpx+An, L=Cpx+Opx+An+Sp, L=Cpx+Gr+An+Sp and L=Cpx+Gr+An+Cor, in its the liquid has essentially silicon and essentially aluminum composition. The second series of eutectic reactions is submitted by one reaction: L=Fo+Opx+Cpx+Gr, which ray leaves upwards on pressure at the singular point (L, Fo, Opx, Cpx, Gr). The presence by this eutectic excludes a possibility of differentiation liquids through a plane $Mg_2Si_2O_6$-$Ca_2Si_2O_6$-Al_2O_3 for compositions containing normative forsterite. This eutectic carries a fundamental character, and keeps the influence with thickening composition by additional components, such as FeO, Na_2O and et. el.

In quartz area the phase mutual relations are investigated less explicitly. Is established, that with pressure 15 kbar and temperature about 900°C the nonvariant point (An,Opx,Ky,Gr,Qz,Cpx) [5, 6] is existence. From this point the rays of some monovariant reactions go out: An+Opx+Ky=Gr+Qz, An+Opx=Cpx+Gr+Qz, Qz+Gr+An=Cpx+Ky and Gr+Qz=Opx+Cpx+Ky.

For established of phase relations in area liqudus a series of some experiments in a cut anortite-enstatite was carried out. On the base results of this experiments the phase diagram of this cut is constructed at pressure 16 kar, and is established, that fuse are happens on a reaction An+Opx=Cpx+Gr+L [7].

The reactions An+Opx+Ky=Gr+Qz and Gr+Qz=Opx+Cpx+Ky are limited a field of a stability of association Gr+Qz in solidus. That is, coesite(quartz) eclogites represent a high-temperature paragenesis existing with moderate pressure. With high pressure it is substituted kyanite eclogites.

At the pressure higher 30-40 kbar the special changes in phase relations of a system CaO-MgO-Al_2O_3-SiO_2 does not happen. The basic changes are connected to a stability of solid solutions. As a result of the formation continuous series of garnet solid solutions in a cut pyrope-grossular is the transformation

of the plane enstatite-wollastonite-alumina in autonomous three component system, the volume of compositions of a system $CaO-MgO-Al_2O_3-SiO_2$ transformations for two independent systems. With the further increasing of pressure (up to 100 kbar) solid solutions ortopyroxenes and clinopyroxenes, apparently, are reduced almost up to pure enstatite and diopside. But the area of compositions solid solutions of garnets are extends, because contents of a majorite component are increase [8].

Thus, the phase relations in a model system $CaO-MgO-Al_2O_3-SiO_2$ by comparison them with known natural deep paragenesis allow to order essential indications describing deep rocks. The phase volumes enable to classify deep paragenesis not entering into an inconsistency with possible genesis of these rocks. The knowledge of phase relations in a model system allows to select paragenetic indications for deep paragenesis on a physical-chemical basis, instead of on a casual set of an empirical material.

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