Experimental investigation of phases equilibriums in system CaO-MgO-Al_2O_3-SiO_2 as a model some upper mantle paragenesis.

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The researchs of the processes of the genesis of magmas and origing of deep-seated rocks are actual problem of geological scienses. The most the productive method which provide the answers to there questions is the experimental investigation the processes in deeps of the Earth. The direct experiments with samples of the rocks and minerals are uneffective sinse there are very complexity to be controled the phisico-chemical conditions in experiments. Therefore, main method of experimental researchs are the investigation by the synthetic model systems, which are consisted from main of components deep-seated rocks. As far as, the oxides Si, Mg, Al and Ca make up 80-90 weights % of the contents in such rocks as lherzolites, dunites, garnet lherzolites, eclogites, garzburgites and etc., the system CaO-MgO-Al_2O_3-SiO_2 has become main object for such experimental investigations.

For the phase diagram of this system CaO-MgO-Al_2O_3-SiO_2 the main interest are represented the experimental researchs monovariant reactions in internal volume of compositions of this system. For this purpers, the beams of the following monovariant reactions are investigated at the interval of the pressure up 12 to 30 кбар: Fo+L=Cpx+Opx+Sp, L=Cpx+Opx+An+Sp, L+Opx+Sp=Cpx+Gr, Fo+Opx+L=Cpx+Gr, Opx+L=Cpx+Gr, L=Fo+Cpx+Opx+Gr, L=Cpx+Gr+An+Sp, Cpx+Cor=An+Sp, L=Cpx+Gr+An+Cor, Gr+An+Q=Cpx+An and the compositions of the coexisting phases on the liquidus and solidus are established.

At high pressure the internal volume of the compositions in the system CaO-MgO-Al_2O_3-SiO_2 is possible to be separated on three enough independent volumes. There are forsteritenormative quarznormative and corundnormative volumes of the compositions. In solidus of the forsteritenormative part of the system is placed the nonvariant point (Fo;Opx;Cpx;An;Sp;Gr) (Kushiro, Yoder, 1966; MacGregor, 1965; Tompson, 1979; Surkov, 1986). In liquidus are recognized two series monovariant eutectic reactions. The first series is submitted by reactions: L=Fo+Opx+Cpx+An, L=Cpx+Opx+An+Sp and L=Cpx+Gr+An+Sp, the liquid of there has considerably silica and alumina composition. Second series is submitted by one reaction: L=Fo+Opx+Cpx+Gr. The beam of this reaction is directed from singularity point (L,Fo,Opx,Cpx,Gr) at high pressure. The occurrence eutectic with normative forsterite prevents differertiations of the liquid hrough plane $Mg_2Si_2O_6$-$Ca_2Si_2O_6$-Al_2O_3. This eutectic should have the fundamental nature, and it preserve this character when the additional components, such as FeO, Na_2O and et.el. are added.

In volume of the composition containing more silica is stabilised the association An+Cpx+Opx+Sp, which passes in series granetbearing associations at pressure higher from beam of the reaction Opx+An+Sp=Cpx+Gr. The existence of reaction Opx+An+Sp=Cpx+Gr has the fundamental significance as border of the high-deep pyrope-garnets facies from facies of low pressure.

In silica volume of the compositions is known the nonovariant point (Ky,Cpx,Gr,An,Q,Opx) (Hensen, 1976; Perkins, 1983), which are defined the phase relations in solidus in this volume of the compositions.

The central nonovariant point of the liqudus part of system $CaO-MgO-Al_2O_3-SiO_2$ is the point (L;Cpx;Gr;An;Sp;Cor). From this point are directed from the beams of the monovariant reactions: L=Cpx+Gr+An+Sp, L=Cpx+Gr+An+Cor, L+Sp=Cpx+Gr+Cor, L+Gr=Opx+An+Sp. As a result, through of this nonovariant point the beams of the monovariant reactions in forsterite- and to quartsnormative voluems of the compositions form the uniform topological grid, which permits to describe the phase diagram of system $CaO-MgO-Al_2O_3-SiO_2$ as uniform whole one.

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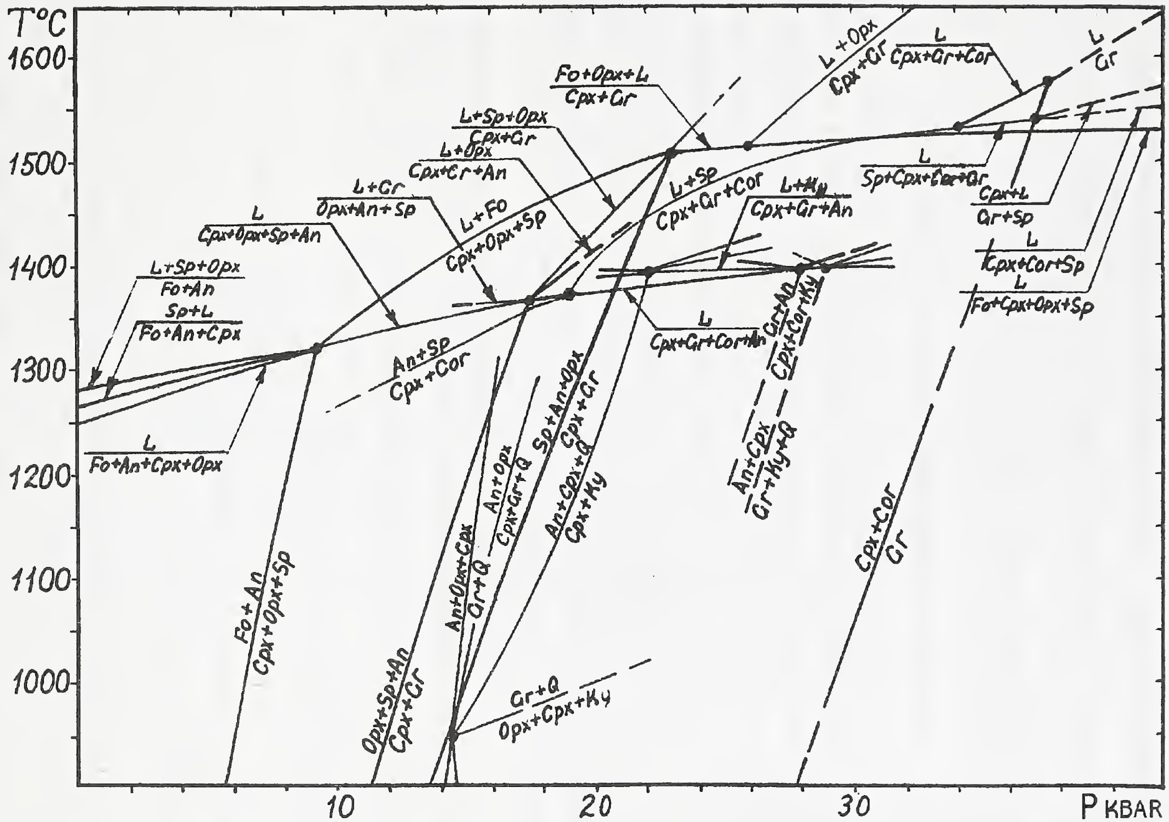

Fig 1. The main monovariant reactions in the phase diagram of system CaO-MgO-Al_2O_3-SiO_2.