GENETIC CLASSIFICATION OF PYROPES OF THE ULTRAMAFIC ROCKS.

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The chemical compositions of pyropes,pyroxenes and other minerals of ultramafic rocks vary in relatively broad scale,as well known, even in same paragenesis of minerals. Special features of this variation contain certain information about genesis and evolution of the rocks. For example the fractionational crystallizationis is a kined of petrogenetic process that is characterized by irreversible change of the chemical compositions of minerals.Irreversible changes (shifts) of compositions probably prevail over mantle. They are reflekted its evolution. But in some cases one can waite for existance of more or less stable conditions where changes of the internal and outward forces are counterbalanced between itself (slow cotectic crystallization; slow exsolutions of minerals).Shift of chemical compositions of minerals in such cases ought to be equilibrium and reversible also.It is interesting to analyse from this point of view the chemical compositions of rockforming minerals. In this report we attempt to identify and select those natural garnet compositions connected between itself by (possible)equilibrium and reversible transitions (by equilibrium shift of chemical compositions).Reaction of exchange by end members of the garnet solution are used in order to describe the changes of its chemical composition. Three reaction are possible in the CFMAS+Cr_2O_3 system :

$$Fe_3Al_2Si_3O_{12} + Mg_3Cr_2Si_3O_{12} = Fe_3Cr_2Si_3O_{12} + Mg_3Al_2Si_3O_{12}$$
$$Ca_3Al_2Si_3O_{12} + Mg_3Cr_2Si_3O_{12} = Ca_3Cr_2Si_3O_{12} + Mg_3Al_2Si_3O_{12}$$
$$Fe_3Al_2Si_3O_{12} + Ca_3Cr_2Si_3O_{12} = Fe_3Cr_2Si_3O_{12} + Ca_3Al_2Si_3O_{12}$$

Nambers of formula units of every end members participated in every exchange reaction are considered as the variables of such system. One can estimate them using a "coordinate of reaction" notion (Prigogine and Defay,1954).Similar approach allows to select the garnet chemical composition connected by (possible) equilibrium and reversible transitions.The changes of compositions in such cases are completely determined by the changes of temprtature(ΔT) and pressure(ΔP).One can estimate the incrementΔP at arbitrary temperature responsible for the equilibrium shift of composition between pair of selected compositions by considering the grain of pyrope as a single phase open system (Kolesnik,1991,1993).That gives a possibility to estimate the equilibrium pressure of the pyrope of interest on the basis of follow formula $P = P_0 + \Delta P$ where P_0 is the pressure of some pyrope (standard) estimated by geobarometer (for example ortopyroxene+pyrope).Depth of

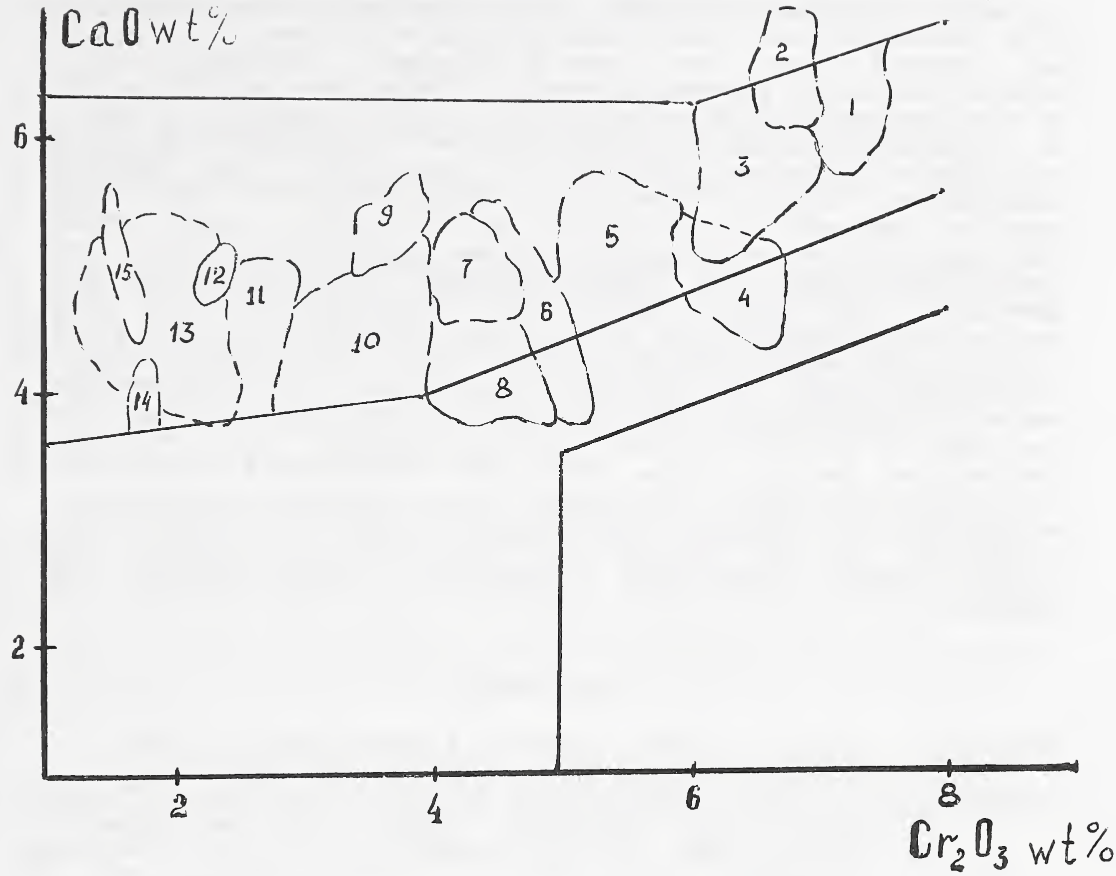

Fig. 1 Chart of the pyrope compositions from different ultramafic paragenesis (heavy discriminating lines) proposed by Sobolev(1977). Equilibrium groups of the pyrope compositions are outlined by broken lines and indicated by Arabic numbers.

formation of pyrope is useful at prospecting of the kimberlite with diamonds.The calculating procedure has been realized as pc program and has been patented (Kolesnik,1993). Classification of pyropes proposed is based on the unification of them as equilibrium groups.Every pyrope composition being in certain equilibrium group can be translated by means of equilibrium and reversible shift of composition into another composition within considered group.Study of about 300 chemical compositions of pyropes of ultramafic rocks shows that equilibrium relationships between garnet compositions are taken shape mainly in lherzolites.Some low-calcium pyropes described by Boyd (1993) in harzburgites are rare exclusions.15 equilibrium groups have been formed.Every group is characterized by certain special feature of compositions of the pyropes (Fig. 1) and other rockforming minerals.Besides certain petrological distinctions of equilibrium groups are recorded.Groups 1-4 (Fig1) are represented by depleted lherzolites mainly.Groups 9-15 are represented by fertile lherzolites enriched by pyroxenes and contained phlogopite, pargasites et cetera (the volatile reservoir of the stable mantle ?). In the groups 5-7 exolutions of pyropes and clinopyroxenes from the aluminious orthopyroxenes are recorded.

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