COGNATE SUITE OF GARNET CLINOPYROXENITE-OLIVINE WEBSTERITE-LHERZOLITE FROM THE UDACHNAYA KIMBERLITE PIPE, YAKUTIA.

L.V. Solovjeva and B.M. Vladimirov.

Institute of the Earth's Crust, 664033 – Yakutsk, USSR.

A suite of garnet clinopyroxenite-olivine websterite-lherzolite (CWL) according to quite a number of petrographic and mineralogical properties determining its cognate character differ from the other granular xenoliths from the Udachnaya kimberlite pipe.

Lherzolites, harzburgites, more rarely dunites of spinel, spinel-garnet and garnet abyssal facies (HL) represented probably metamorphosed restites, which are remnants after extraction of basaltoid and komatiitic melts strongly predominate in the granular deep-seated xenoliths from the Udachnaya pipe. Rocks of the CWL suite make up not more than 3% in granular population. In contrast to the HL suite they are characterised by a wide variation of garnet, pyroxenes, olivine and are classified as garnet lherzolites, garnet-olivine websterites and garnet clinopyroxenites. The presence of phlogopites and sulfides, developed in the form of globules in garnet and clinopyroxene and in the form of dispersed impregnation are characteristic of lherzolites and olivine websterites of the CWL suite. Small inclusions of ilmenite and Ti-spinel are observed in phlogopite plates. Ti-spinel does not exhibit reactional relationships with garnet. Thin exsolved intergrowths of ilmenite and rutile are common for garnet and pyroxenes. Rock texture suggests a paragenetic character of phlogopite plates. Phlogopite, ilmenite, Ti-spinel and impregnated sulfides appear to be crystallized at the late stage of formation of the main paragenesis. Reactional mineral assemblage is manifested in the form of polymineral kelyphite rims on garnet, orthopyroxene and in the form of reactional djerfisherite zones on sulfides.

Minerals of the CWL suite essentially differ from corresponding minerals of the HL suite in lower Mg/Mg+Fe ratio of silicates, higher TiO_2 contents in garnet and clinopyroxene and lower Cr_2O_3 contents in garnet, and higher Na_2O and Al_2O_3 contents in clinopyroxenes. Direct correlations between Mg content in olivine, garnet, clinopyroxene and phlogopite as well as between TiO_2 and Cr_2O_3 contents in garnet and clinopyroxene, are observed. These correlations are probably expected to be the evidence of the total equilibration of the chemistry of minerals at the late stage of rock formation at a moment when phlogopite, sulfides, ilmenite and Ti-spinel were crystallized. On the basis of Fe and Mg distribution (Ellis, Green, 1979) between small regular clinopyroxene crystals in garnet and host-garnet and for large grains of these minerals in rock, the higher temperatures of the begining of crystallization are obtained. The position of five samples of the CWL suite on geotherm for the Udachnaya pipe corresponds to two levels, 60-70 km and 120 km, respectively. Bulk chemical composition of two samples is the most consistent with komatiites of peridotite type. All the above data do not contradict a hypothesis of magmatic origin of the CWL suite. Its intrusion and fractional crystallization appear to have taken place after the main episode of cooling and metamorphism of the mantle lithosphere but prior to development of prekimberlite metasomatism.