UPPER MANTLE COMPOSITION BENEATH YAKUTIAN KIMBERLITE PROVINCE.

A.V. Ukhanov[1] and A.D. Kharkiv[2].

(1) Vernadsky Institute of Geochemistry and Analytical Chemistry, Moscow; (2) Central Research Institute of Geological Prospecting for Non-ferrous and Precious Metals, Moscow.

Mineralogical studies in Yakutian province have shown that "sampling" by kimberlitic magma seems to be rather selective. There are a lot of gaps and misrepresentations even in the most complete and informative upper mantle "sections" drafted on the basis of P-T "records" in mantle mineral assemblages.

On the P-T plots (Ukhanov, Ryabchikov, Kharkiv, 1988) the points are scattered along smooth curvilinear trajectories what are thought to be paleo-geotherms. They are consistent with continental geotherms by Clark and Ringwood (1964) for "Obnazhennaya" and "Udachnaya", but "Mir" geotherm is shifted 100-150 C to lower temperatures. In contrast to Lesotho geotherm by Boyd (1976) no inflexions or breaks have been revealed in Yakutian ones. That implies more stable thermal regime in Yakutia in the period of kimberlitic magmatism. The reconstructed upper mantle "sections" for the north (Obnazhennaya), middle (Udachnaya) and south (Mir) of the province are grossly drafted . In general the upper mantle of the region is characterized : 1) by wide extended spinel or partly granatized peridotites of "barren" type directly below Moho; 2) by prevalence of "fertile" garnet peridotite, sheared or unsheared, at deeper levels; 3) by the presence of various garnet-pyroxene rocks - Mg-rich pyroxenites at more shallow levels and eclogites at depth; 4) by spreading of ilmenite-bearing rocks through the whole sections and amphibole-flogopite metasomatite in their upper parts.

In this paper emphasis is placed on the origin of some garnet-pyroxene rocks. More than ten subgroups of them can be distinguished within the investigated xenolith suites but at present only for the largest ones reliable petrogenetic interpretations can be proposed. The geologically spectacular xenoliths of the coarse garnet pyroxenites, which are so abundant in "Obnazhennaya", have visible banding and are composed of 3 to 5 minerals enriched in MgO and Cr (Cpx+Gar+Opx+Ol+CrSp). Taken as a whole the xenoliths resemble fragments of a layered intrusive body. If it is more than appearance and the rocks are fundamentally magmatic the garnet cannot be a magmatic mineral in any case since

it seems to replace the chromium spinel and partly pyroxene. Before the replacement the layers had consist of Opx, or Cpx , or both and at least locally of plagioclase that has been pointed to by the positive Eu anomalies on REE patterns revealed for some nodules. At the same time the negative Eu anomalies for orthopyroxene and chromium spinel indicate that these two minerals had been crystallized together with plagioclase like in basic-ultrabasic magmas.

A portion of the magma is thought to be intruded in the top of the mantle sequence to form a vast layered massif with chromite horizons and zones enriched in sulfides. In that connection it is worth to mention extremely high gold abundances (up to 6 ppm) in rare xenoliths and chromite ore nodules in some pipes. The following garnet development in layered pyroxenites was caused by pressure increasing under some fluid influx. The ultramafic basis of massif was transformed to the garnet lherzolite which appears to be depleted in less degree than the more shallow harzburgite.