GEOLOGY, PETROLOGY AND MINERAL COMPOSITION OF THE UDACHNAYA KIMBERLITE ORE COMPLEX (YAKUTIA).

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The Udachnaya kimberlite ore complex consists of two large conjugate pipes, a eastern pipe, Udachnaya-Vostochnaya (UV) and a western pipe, Udachnaya-Zapadnaya (UZ), as well of three satellite pipe bodies and eight kimberlite veined bodies. The Mezozoic veins composed of potassic trachites and dykes of dolerite and trachidolerites are spatially associated with kimberlites. All kimberlite veins are intruded by satellite bodies and the UV and UZ pipes. A part of veined kimberlite bodies do not outcrop and occur only as fragments in the UZ and UV pipes. Satellite pipes are the "blind" bodies and do not contact with the UV and UZ pipes. The main UV and UZ pipes are characterized by a composite geological structure. Four phases of kimberlite emplacement are distinguished for the UZ pipe and five phases for the UV pipe. Intrusive contact relationships allowed to eatablish the sequence of formation for each pipes.

The history of formation of the Udachnaya kimberlite ore complex comprises four stages. Geological and radiological data show a significant (> 50m.y.) time interval between separate episodes of kimberlite magmatism. The first stage is characterized by the formation of kimberlite veins. The "blind" veined bodies are composed of mica kimberlite with pyroxene matrix, containing sometimes an abundant amount of sphene (10-20%).Mineral and chemical compositions of this kimberlite type are similar to those of olivine lamproites of Australia and lamprophyres of Swartruggens. The outcroped veins are composed of calcite kimberlite with a varying phlogopite content. Sr, C and O iso-

topic compositions together with Sr and Ba distribution in calcites from veins indicate that two sources (mantle and sedimentary) are responsible for carbonate formation. At the second stage stock-like bodies composed of monticellite kimberlite intruded the UV and UZ pipes. This kimberlite type (I phase) is characterized by a pronounced zoned olivine with higher Fe/Fe+Mg ratio and CaO content. Low mg and high content of impurities of Al, Ti and Na are characteristic of monticellite. A rare assemblage of sodium minerals (sodalite, zemkorite, shortite) occurs in matrix of monticellite kimberlite from the UV pipe. At the second stage another two phases are formed in UZ pipe:1) massive kimberlite with phlogopite-carbonate matrix (II phase), 2) kimberlite breccia (III phase). Micaceous kimberlite composing a large intrusive body with vertical contacts in the UZ pipe, is mineralogically similar to veined carbonate kimberlite. The third stage is characterized by the greatest volume of kimberlite material represented in the form of: 1) kimberlite breccia of IV phase in the UZ pipe and 2) kimberlite breccias of II, III and IV phases in the UV pipe. At this stage three satellite pipes, composed of intensively carbonatizated breccias are probably formed. The kimberlite breccia of the UZ pipe contains a lot of fragments of the early phases (up to 50-70%) and crust inclusions. In kimberlite breccias of the UV pipe an amount of xenoliths of country rock already comprising many mantle inclusions increases progressively from II to IV phase.

At the fourth stage of formation of the Udachnaya kimberlite complex a suite of veined bodies (V phase) is intruded into the UV pipe. The bodies are composed of massive kimberlite with olivine-monticellite matrix. This kimberlite type differs from monticellite kimberlite of stock-like bodies of I phase of the UV and UZ pipes in olivine, monticellite, spinel and other minerals contents.

Comparison of kimberlites of different ages within the complex shows the distinct differencies in mineral, petrochemical and isotope-geochemical compositions. Kimberlites of each stage are characterized by its own composition and evolutional trends of crystallization of silicate and particularly of ore minerals of phenocrysts as well as of matrix. Variations in mineral composition of kimberlites depend on distribution of petrogenetic oxides and rare elements in rocks.

Variety of comagmatic kimberlite rocks from the Udachnaya complex indicates that two initial magmas are derived from different (saturated and slightly depleted) mantle sources. In addition, evolution trend and degree of differentiation of each magma were different.