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Pyroxenite xenoliths from the quaternary volconoes of Spitsbergen. Evidance for magmatic evolution.

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The origin of the pyroxenites, not only in the Spitsbergen area, but also in other occurrence of alkali basalt volcanism is debatable in petrology. Generally, pyroxenites represent either cumulates or melts formed after fractionation of picritic or basaltic composition, or as the result of complete crystallization of these melts. The features of pyroxenites formation are the key point in the history of magma evolution, e. g.generation and fractional, in the upper mantle. Natural samples of pyroxenites provide the data, which could be useful in the solution of petrogenetic problems.

Pyroxenites from Cenozoic volcanoes of archipelago Spitsbergen represent the rocks, which contain 85% of high-alumina augite and orthopyroxene, garnet and spinel. A significant number of pyroxenites contain amphibole in equilibrium with clinopyroxene.

Formation of fine-grained zones of recrystallization (with plagioclase and olivine) is close occur, it replace up to half the rock volume.

Clinopyroxene contains orthopyroxene lamella which formed as a result of the process of decomposition of solid solutions. For the melt solidification of basic composition the augiteclinopyroxene is in equilibrium with enstatiteorthopyroxen with a high content of the diopside component. Upon for the cooling the dissolution in orthopyroxene and clinopyroxene causes the formation of augite lamella in the orthopyroxene and enstatite lamella in clinopyroxene. Thermobarometric estimates for primary augite (calculatedcomposition) and in equilibrium with enstatite (in the form of lamellae) confirm the existence of cooling process. Thus, the calculations for primary augite are 1100°C and 20 kbar, the equilibrium augite-enstait (ingrowths) is 1000°C and 17 kbar.

These occurred observations reflect the complex evolution of the melts in the mantle: generation of melts – fractionation – long time cooling – perhaps partial melting.

Some geochemical and experimental data enable us to prove such assumption as anatexis of the upper mantle lherzolite to explain the origin and generation of pyroxenites. They may represent the melts formed at initial stages of lherzolite melting while the elimination of Ca-rich clinopyroxene. This assumption probably reflects the high CaO (15-22 wt.%), $Al2O_3$ (15-25%) and MgO (15-30 wt%). Different types of pyroxenites are the result of thermodynamic conditions and volatile content speciation during the crystallization.

It is known, from the experimental studies,that the melting of pyroxenites yields a tholeiite-like melts. Consequently, we may assume that the melting processes in pyroxenites observed in presented samples are related with Juarassic-Neogene magmatic processes in Spitsbergen area.