TWO SERIES OF MEGACRYSTS FROM KIMBERLITES OF THE VERKHNEMUNSKOYE FIELD (REPUBLIC OF SAKHA)

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Megacrysts of garnets and some other minerals (olivine, clinopyroxene, orthopyroxene, picroilmenite, phlogopite) are characteristic of many kimberlite pipes. Of particularly frequent occurrence are nodules of relatively low-chromous garnet and picroilmenite. In single kimberlite pipes of USA and South Africa two series of megacrysts are met with, one of them featuring low Cr_2O_3 content (increased TiO_2 content), and the second one being rich in Cr_2O_3. Domestic kimberlites, up till now, were known to feature, by and large, the first series of megacrysts. However, we report on findings of the relatively high-chromous series in the Zimnyaya, Novinka and Komsomolskaya kimberlite pipes of the Verkhnemunskoye field.

The low-chromous series is represented by garnet, picroilmenite, olivine, enstatite, in rare cases - phlogopite. Garnet occurs in the form of rose- and orange-coloured nodules of size I.5 - 9.0 cm. It exhibits Cr_2O_3 contents varying from I to 2.6 %; TiO_2 = 0.6 - I.4 %; f = 0.2I - 0.27. Olivine nodules are pale-brown, 2 - I0 cm in size; f = 0.09 - 0.I2. Orthopyroxene is represented by nodules of size I.0 - 7.5 cm, bottle-green, yellowish-green and light-green, with f = 0.08 - 0.II. Ilmenite occurs as nodules of size I.0 - 5.0 cm with MgO content varying from 7.5 to I8.5 %; TiO_2 = 48.0 - 59.5 %; Cr_2O_3 = 0.9 - 6.0 %. High-chromous ilmenite varieties typically feature chromium-containing titanomagnetite and chrome-spinellid disintegration structures.

The high-chromous series of megacrysts is represented by garnet and olivine. Garnet occurs in the form of purple-red and dirty-green nodules of size I.5 - 8.5 cm, with Cr_2O_3 content varying from 5.84 to I2.40 %, CaO = 3.59 - 6.45 %, TiO_2 = 0.53 - I.50 %, f = 0.I6 - 0.I8. Olivine megacrysts run up to 8 cm across and feature pale-greenish colouration; f = 0.7 - 0.9.

A peculiar feature of the megacrysts at question is their partial melting manifested in emergence of branching differently-thick stringers inside the megacrysts. These stringers are accompanied by widenings and differently oriented, thus forming loop and grating textures. Stringers and their thickenings are made up by crystallized aggregate involving ortho- and clinopyroxenes, chrome-spinellid, phlogopite, amphibole, glass and, in rare cases, olivine grains. These minerals feature an original composition; the composition of some of them (chrome-spinellid and others) depends on that of the replaced garnet.

Oxide contents in chrome-spinellids vary within the following ranges (in %): Cr_2O_3 = 8.60 - 59.72; Al_2O_3 = 4.98 - 5I.65; TiO_2 = 0.I3 - 5.04. Clinopyroxene features high Al_2O_3 contents (7.7I - I2.23 %), as well as those of Cr_2O_3 (0.49 - 3.98 %), and TiO_2 (0.79 - I.I4 %). It is classed as a subcalcic variety

(Ca/Ca + Mg = 0.33 - 0.45). Orthopyroxene qualifies as alumobronzite (Al_2O_3 = 7.50 - II.82 %, Cr_2O_3 = 2.04 - 3.65 %, CaO = = I.45 - 3.09 %). Phlogopite composition also varies within a wide range (in %): Cr_2O_3 = 0.I8 - 4.00; TiO_2 = 0.I8 - 3.32; FeO = 2.90 - 6.24.

Recrystallization products of submelted garnet nodules are similar in the typical set of minerals and their compositions to reaction kelyphitic rims developed around garnet grains in upper mantle rock xenoliths and differ in mineral composition from kelyphitic rims surrounding pyrope grains in kimberlite. These latter rims are represented, by and large, by phlogopite; chrome-spinellid and pyroxenes occur here infrequently.

The process of partial melting of magnesial garnet had apparently proceeded under upper mantle conditions prior to the garnet's ingress into the kimberlitic transporter. It is likely that the melting was initiated by an inflow of alkali- and water-rich abyssal fluids. This effect was accompanied by subtraction of silicium, aluminum and magnesium. Crystallization of submelted parts of garnet grains occured under reduced pressure and high temperature; according to the data of available geobarometers and geothermometers, p = I2.7 - 24.8 GPa; T = I2I0 - I5I0 °C.