THE MELA SILL AS THE CARBONATITE-KIMBERLITE BODY NORTH-RUSSIAN PROVINCE, RUSSIA.

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In addition to pipe and dyke bodies three sills have been found in the North-Russian kimberlite province (Arkhangelsk region). One of them, the Mela sill, is known (Stankovskyi et al., 1977) as an individual kimberlite body, located of kimberlite pipes 30 km northward from the main area. The authors suppose that the high content of carbonate component results from the superimposed intensive carbonatization. The host sill rocks are the terrigenous layered sediments of siltstones, argillites, sandstones.

The Mela sill is obsrved on three sites, which are 400 and 1000 m apart. A gradual decrease of the thickness of layered bodies (from 1.5 m on the northern site to 0.2 m on the southern one), a gradual increase of relative volume of the carbonate (calcite) layers, occupying the upper sill part and a similar kimberlite composition confirm that these three sites originated from the common incurrent canal.

The kimberlite occurs as an the aggregate of serpentine calcite and montmorrilonite. The groundmass consists of phlogopite (the content increases from the northern to the southern site), titanomagnetite, apatite. There are garnets and spinellide as accessory minerals. The calcite sometimes with the dolomite is included into the matrix, forms the nodular elongated segregations, veinlets in the massive kimberlite, as well as separate layers. The latter are generally filled by small-medium crystalline calcite. The Mela sill contains rare subzones, lenses, in which differently oriented large calcite laths form the framework spinipheks-like texture.

Garnet is small grains of pyrope-almandine composition (to 44% of pyrope minal).

The spinellide constitute the major part of heavy fraction. Titanomagnetite is predominant, the alumospinel (18-22%) and titanospinel (21-27%) minals being most significant. The larger idiomorphic chrome-spinellid crystals are rare. Cr_2O_3 content varies from 23.3 to 54.3 %. The zoned spinellide are found. The central parts of these spinellide consist of magnetite, chrome-spinellid, while the peripheral ones are represented by titanomagnetites, similar in composition to the titanomagnetites of the kimberlite matrix.

Phlogopite forms small tabular crystals in the matrix. It is also found in calcite-bearing aggregates as the rims around spinellid grains. The phlogopite often displays the zoned pattern which is marked by the increasing of FeO, Al_2O_3 and BaO contents (up to 11.16%) and decrease of K_2O, Na_2O, TiO_2 and Cr_2O_3 contents towards the marginal parts.

The chemical kimberlite composition of the Mela sill (SiO_2 - 24.04; TiO_2 - 1.15; Al_2O_3 - 4.32; Fe_2O_3 - 11.31; FeO - 1.52; MnO - 0.31; MgO - 17.84; CaO - 18.00; Na_2O - 0.15; K_2O - 0.40; P_2O_5 - 1.13; H_2O - 8.88; CO_2 - 11.09; F - 0.23) is comparable with the Benphontein sill kimberlite composition (Dawson, Hawthorne, 1973) and is marked by a higher carbonate component and very high iron oxidation.

The rare element composition of rocks (in ppm): Cr - 800-1700); Ni (240- 1100); Co (15-76); Sc (8-12); V (200-210); Zn (25-190); Pb (5-14) Cu (7 -45); Sn (1.7-3.2); Ag (0.6-1.2); Zr (20-90); Nb (90-120); Li (26-80); Rb (5-20); Sr (1200-1600); Ba (2400-3000); La (140-250), Ce (210-440); U (4-19); Th (4-29) characterizes them as kimberlites considering the maximum contents of compatible elements and those of incompatible elements (Sr, Ba, TR, U, Th) to be carbonatites.

It should be noted, that the carbonate component is different from the silicate one in the lover isotope ratio $^{87}Sr/^{86}Sr$ (0.70361 and 0.70523 correspondingly). High Sr, Ba and TR contents in the calcite, low isotope Sr composition indicate the magmatic mantle nature of the carbonate component.

Thus, the features of mineralogical, chemical, microelement compositions of oxide-silicate phase characterize the rocks, filling the Mela sill as the kimberlite; the isotope-geochemical composition of the carbonate phase, the confined apatite-phlogopite mineralization correspond to the typical carbonatite characteristics.

Stankovsky,A.F., Verichev,E.M. , et al. 1079 Doklady Akademii Nauk SSSR, 247, N 6,pp. 1456-1460(Russian).
Dawson J.B. and Hawthorne J.B. 1973.
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