MINERALOGY OF ALKALINE TITANATES-BEARING KIMBERLITE FROM A DIKE, WEST-UKUKIT KIMBERLITE FIELD, YAKUTIA

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Study of kimberlite of the An-22 dike has revealed two associations which are rare for kimberlite rocks: alkremitic one and that of alkaline titanates. The kimberlite is fine-porphyritic, massive. Phenocrysts are represented by carbonate-serpentine pseudomorphs after olivine and by rare phlogopite grains. The carbonate-micaceous groundmass has a non-uniform, microtaxitic texture (Kornilova et al., 1983). Ore minerals in the mesostasis are rutile, non-Mg ilmenite and Ti-bearing iron oxides.

Also present in the kimberlite are numerous picroilmenite macrocrysts and few kelyphytized grains of grossular-almandine-pyrope garnet. Besides, heavy-mineral concentrates show the presence of abundant anhedral grains of rutile and few grains of chrome-spinels, chrome-diopside, Cr-bearing garnet and moissanite.

Most of the discrete garnet grains contain spinel inclusions (5-10 mcm) with 62.2-67.6 wt % Al_2O_3, which permits us to refer this association to alkremitic. Moreover, the garnet has picroilmenite inclusions and forms intergrowths with spinel containing 58.7 wt % Al_2O_3 and with orthopyroxene containing unusually high Al_2O_3 concentrations (11.5 wt %). As distinct from garnets from the earlier described alkremitic associations, standard microprobe analysis of the mineral from the An-22 dike shows the absence of Cr_2O_3 and 0.4-0.7 wt % TiO_2. In their total FeO (10.4-12.8 wt %), the garnets are intermediate between pyropes from alkremites (Nixon et al., 1978; Ponomarenko, Leskova, 1980; Botkunov et al., 1987) and ferrialkremites (Garanin et al., 1988). A distinctive feature of this association is the presence of picroilmenite and the appearance of TiO_2 admixture in all of the other co-existing minerals. It should be noted that garnets of similar composition are widely distributed in kimberlite breccias in pipes of the northern fields of the Yakutian kimberlite province (Ilupin, Sandomirskaya, 1984).

Mineragraphic study of rutile macrocrysts has shown that some individual grains have, along their peripheries, fragmentary shells made up of an aggregate of numerous anisotropic crystallites 5 to 15 mcm in size. As revealed by microprobe analysis, such formations represent an aggregate of irregularly arranged (relative to each other) grains of K- and Na-titanates. The composition of the K-titanate is calculated well enough to the crystallochemical formula of priderite - $(K_{1.386}\ Na_{0.067}\ Ba_{0.033})_{1.486}(Ti_{7.070}\ Al_{0.026}\ Fe_{0.649}\ Mg_{0.349})_{8.084}\ O_{16}$ (Jaques et al., 1986). The Na-titanate is close in TiO_2

contents (up to 79.4 wt %) to freudenbergite from Liberian granulites (Haggerty, 1983), but has higher Na_2O concentrations (up to 9.7 wt %), making it impossible to calculate the obtained compositions to the crystallochemical formula of Fe^{2+} -freudenbergite. The rutile has Nb_2O_5 admixture up to 0.7 wt %, as well as oriented picroilmenite lamellae. The character of the relationship between the rutile and the aggregate of alkaline titanate grains indicates a metasomatic nature of the latter, whereas their co-existence in one paragenetic association evidences simultaneous introduction of both K and Na.

One characteristic feature of the mineralogy of the An-22 dike kimberlite is an important role of TiO_2 in all three main associations: kimberlitic, alkremitic and that of alkaline titanates. This is indicative of the upper mantle enrichment in this incompatible component in this area, perhaps, due to mantle metasomatosis.

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