TYPOMORPHISM OF MICROCRYSTALLINE OXIDES FROM KIMBERLITE GROUNDMASS IN ARKHANGEL KIMBERLITE PROVINCE

Garanin V.K., Posukhova T.V.

Moscow State University, Geological department, Moscow, Russia

The peculiarities of microcrystalline oxides from groundmass in 10 pipes of Arkhangel kimberlite province were investigated by optic and microprobe methods. The data base, including 396 full microprobe analyses of spinels ilmenites and rutiles from Zolotitskoye, Verkhotinskoye and Kepinskoye kimberlite fields and Tourinskoye basaltic groups was composed. By cluster analyses methods 12 chemical-genetic groups of microspinels, 5 chemical-genetic groups of microilmenites and 2 chemical-genetic groups of microrutiles were distinguished. The oxides from this groups differ by contents of main components and by distribution in different kimberlite pipes. The high- and middle-Cr-picrochromites of the first and the second cluster groups are attributed to the beginning of the crystallization processes They occur in inner parts of grains and form inclusions in microcrystalline olivine. The Fe-Ti-rich phases belonging from the eighth to the tenth cluster groups characterize the ending of crystallization processes. They occur in outer parts of microcrystalline grains in kimberlite groundmass.

The physical-chemical, thermodynamic and kinetic conditions of kimberlite crystallization were estimated at the base of microcrystalline phases chemical composition peculiarities. The high- and middle-Cr-picrochromites of the first and second cluster groups were crystallized in deep conditions in diamond-established thermodynamic region. The picroferro- and picroferrichromites belonged from the third to the fifth cluster groups and the Mg-Cr-Al-titanomagnetites belonging from the eighth to the tenth cluster groups were crystallized in less depth in diamond-non-established thermodynamic region.

It was established, that the long and difficult kimberlite magma evolution was accompanied by modification of P-T and red/oxidation conditions. The later may be traced by the crystallization trends, which are specific for each kimberlite field and pipe.

It was established, that the rich pipes of Zolotitsky field are characterized by parting (sharing) trend: from the high- and middle- Cr-picrochromites of the first and the second cluster group to Cr-ulvospinels belonged from the sixth to the seventh cluster groups. The first prevails. The high-Ti-ferrous phases, such as ilmenites and rutiles are absent in Solotitsky field. It is very important, that the high-Cr-picrochromites (< 53,0 mas.% Cr_2O_3; > 3,5 mas.% TiO_2) of the first cluster group were established only in Zolotitsky field pipes and in Verkhotinsky and Kepinsky field kimberlites they are absent.

The poor pipes of Verkhotinsky field are characterized by sharing trend. There are only two kinds of oxides: the middle - Cr - picrochromite of the second cluster group and the Mg - Cr - Al - titanomagnetite of the eighth cluster group. The last kind of oxides prevails. Another phases are absent. It means, that the kimberlites of Verkhotinsky pipes formed in lesser depths and under the conditions of higher oxygen fugacity, than the kimberlites of Zolotitsky pipes.

The poor pipes of Kepinskoye field are characterized by full trend: from middle-Cr-picroferrochromites of the third cluster group to magnetites of the tenth cluster groups, ilmenites and rutiles. The occurrence of middle - Cr - picroferrochromites of the third cluster group means, that these kimberlites were formed at the smaller depths in diamond - non - established thermodynamic region. The occurrence of titanomagnetites, ilmenites and rutiles means, that these kimberlites have been forming during the long time, under the conditions of fast and high increasing of Fe^{3+} and oxygen activities.

The difference of kimberlite magma evolution has the result in diamondiferrous of kimberlite pipes and it must be take into account during prospecting and explorating works.