OLIVINES IN SHANDONG KIMBERLITES.

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Occurrences:

Generally, olivines in the kimberlites from Shandong have been recognized to have six main modes of occurrences:(1) megacryst (>10mm)(pseudomorph); (2) coarse grained (macrocryst) olivine (5-10mm); (3) medium grained olivine (2-5mm); (4) microgranular or groundmass olivine (0.005-0.5mm); (5) olivine as inclusion in diamond; (6) olivine (pseudomorph) of deep seated xenolith in kimberlite.

Content and morphology:

Content of the olivine together with its alteration product ranges widely from 20 to 80%, but usually 25-50%.

Morphologically, olivines of different size may be distinguished. Large olivines are anhedral, rounded to elliptical grain, but small olivines occur as subhedral to euhedral crystals.

Color:

Colors of olivines in Shandong kimberlites range from colorless to greenish and green. Relationship between colors and sizes of olivines has been known, the large crystals are colorless and greenish, but the small crystals (groundmass olivines) are green.

Zoning:

The olivines in Shandong kimberlites show complex zoning patterns.Three compositional variation trends have been observed from core to rim in the olivine: (1) iron-rich trend; (2) magnesian-rich trend; (3)iron-rich and magnesian-rich trends are present in the same olivine. Although the zoning patterns are complex, the major-element zoning is, however, very limited, usually causing less than 0.5% F_o variation between core and rim (Fig.1).NiO and CaO variations are weak and complex.

Mineral chemistry:

The olivines in kimberlites from Shandong are highly magnesian , Fo content being 90.2-92.5%.

The olivine compositional variation is correlated with their colors. Colors range from colorless and greenish to green with increase of Fe content.

Early generation olivines contain richer in F_o (90.9-92.5) than the late generation olivines (F_o 90.2-91.5) (Fig.2).

The differences in composition of the olivines exist between the individual kimberlites with different diamond contents, such as olivines of Shengli-1 pipe have more F_o contents than the Hongqi-6 pipe with decrease of diamond contents in the kimberlites.

Olivines as inclusions in diamonds are extremely rich in F_o and have relatively restricted within 93.06-100.

CaO (<0.14%), NiO (<0.74%), Cr_2O_3 (<0.17%) and TiO_2 (<0.17%) contents of the olivines are extremely low. Increases in CaO contents of the olivines are correlated with increases in F_a. The general trend of increasing Ni_2SiO_4 (Ni-olivine) with increasing F_o is observed.

Olivines as inclusions in diamonds are high in Cr_2O_3 (up to 1.29%).

The olivines of late generation contain more TiO_2 (up to 0.17%) than those of early generation (<0.11%).

Infrared absorption spectrum:

There are 10 strong absorption bands (982, 948, 880, 837, 606, 510, 465, 420, 380, 363 cm^{-1}) within 350-1200 cm^{-1} of infrared absorption spectra of olivines from Shengli-1 pipe. The presence of 420 and 606 cm^{-1} shows that the olivine studied belongs to forsterite.

Origin:

All the groundmass olivines are true phenocrysts. Coarse and medium grained olivines predominantly are phenocrysts except a little sources of fragmented megacryst and dunite -lherzolite xenoliths.

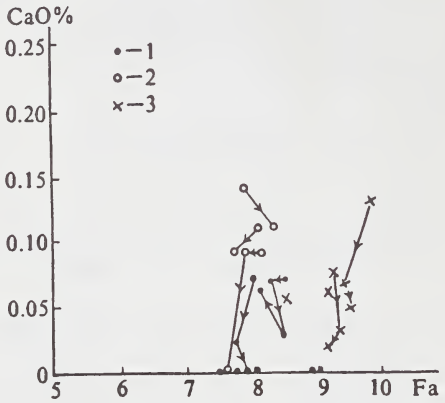

Fig.1 CaO versus Fa for olivines in Shengli-1 pipe from Shandong Province

1-coarse grained olivine; 2-medium grained olivine; 3-microgranular(groundmass) olivine

(The arrow shows zonation variation trend from core to rim)

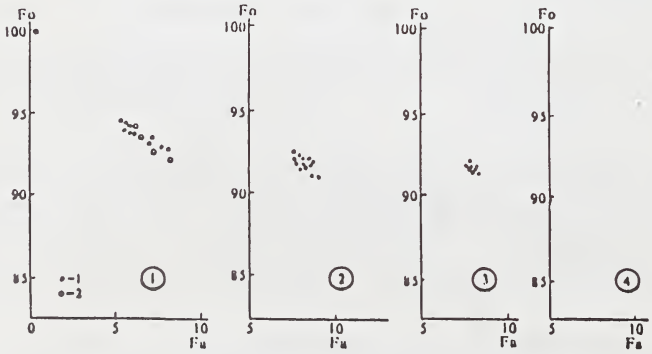

Fig.2 F_o versus F_a for olivines of different occurrences

① 1-olivine as inclusion in Shandong diamonds; 2-olivine as inclusion in diamond (Meyer 1987);

②coarse grained olivine;③medium grained olivine; ④microgranular(groundmass) olivine