MICAS IN KIMBERLITES FROM CHINA.

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Occurrence:

Micas, the common minerals of kimberlites from China, have seven modes of occurrence: (1) megacryst (1-10cm); (2) macrocryst (5mm-1cm); (3) microphenocryst and groundmass mica (0.005 -1mm); (4) reaction and replacement product micas as rims upon olivine or garnet; (5) mica intergrowths with Cr-spinel, ilmenite and magnetite; (6) mica as epigenetic inclusion in diamond; (7) mica in deep seated xenolith from kimberlite.

Content:

The abundance of micas in kimberlites varies widely from 2 to 50%, but often 5-20%. Free- and poor- diamond kimberlites (Northern Liaoning, Guizhou, Hubei, Henan, Hebei and Shanxi) richer in micas than those of rich-diamond kimberlites (Shandong and Southern Liaoning).

Variety:

The micas inkimberlites of China mainly belong to phlogopites, Mg-biotite and Fe-biotite are rare according to Guidotti's (1975) classification method (Fig.1). The varieties of micas of different occurrences are not alike, such as, major megacryst and macrocryst micas belong to phlogopite. Groundmass micas fall into phlogopite-Fe-biotite field, but most of them are phlogopite-Mg -biotite. The tetraferriphlogopites are phlogopite. Mica intergrowths with Cr-spinel, ilmenite and magnetite, and epigenetic inclusion in diamond are phlogopite - Mg-biotite.

The lamproite micas belong to Mg-biotite.

Color, pleochroism and morphology:

The megacryst and macrocryst micas occur as silvery yellow. Most megacryst and some macrocryst micas are rounded, broken, distorted or kink banded and show undulose extinction. Some macrocryst micas occur as sieve texture, showing several olivines (Pseudomorph) have been included in same mica. Groundmass micas are yellow-brown in color. Based on the optical property, micas in kimberlites can be divided into two groups: normal and reversed pleochroism. Reversed pleochroism micas are not present in the deep seated xenoliths that contain micas. Generally macrocryst micas with normalpleochroism have been replaced by reversed pleochroism micas along cleavage planes and margins.

Zoning:

Macrocryst micas exhibt complex TiO_2- Cr_2O_3 zonation, showing disorderly variaties from cores to rims, reflecting changes of the complex formation conditions.

Mineral chemistry:

Megacryst and macrocryst micas are rich in Cr_2O_3 (up to 0.44%), poor in FeO (1.75-6.34%). Primary groundmass micas occur as tetraferriphlogopites and titanian phlogopites, most of them are high FeO, low Cr_2O_3 (<0.30%). There exist significant differences between groundmass micas of diamond-rich and -poor or -free kimberlites, the former (e.g. No.50 kimberlite pipe in Liaoning) contains lower in FeO (2.84%) and TiO_2 (1.59%) than the latter (such as Shanxi and Hebei kimberlites, FeO up to 21.07%, TiO_2 4.98-6.39%). The micas showing reversed pleochroism are characterized by Fe^{3+}-rich, Al_2O_3-deficient at tetrahedral sites. Most megacryst and some macrocryst micas are probably xenocrysts which have compositions similar to primary micas in deep seated xenoliths, but other that differ from xenolith phases are phenocrysts which formed during the early stages of crystallization. Micas in lamproites from Guizhou and Hubei are higher in TiO_2 (8.48-15.72%) and FeO (9.78-14.89%), and lower in Cr_2O_3 (<0.11%), NiO (<0.20%), Mg/(Mg+Fe)(63.50-75.46%) than those of kimberlites.

Micas in kimberlites contain 0.10-0.11% Rb_2O, 0.005-0.041% Li_2O, 0.06-0.07% Ba, 0.008-0.010% Sr, 0.003-0.004% Zn, 0.003-0.004% Ga, 5-9 ppm Cs_2O, 8.8-10.9 ppm B and 1-3 ppm Be, respectively.

Megacryst mica from Shandong kimberlite contains 34.67 ppm total REE, 0.25-27 times chondritic abundance, which is not principal carrier of REE in kimberlites. REE distribution pattern for kimberlite mica is similar to that of minette (Shanxi), but the latter contains more total REE (63,94 ppm).

Transformation of heating mica:

The study of transformation for the heating mica has been untaken by chemical analyses, x-ray analyses, infrared absorption spectra and Mossbauer spectra. The heating micas at 1100 °C have been transformed into olivines and leucites (Fig.2).

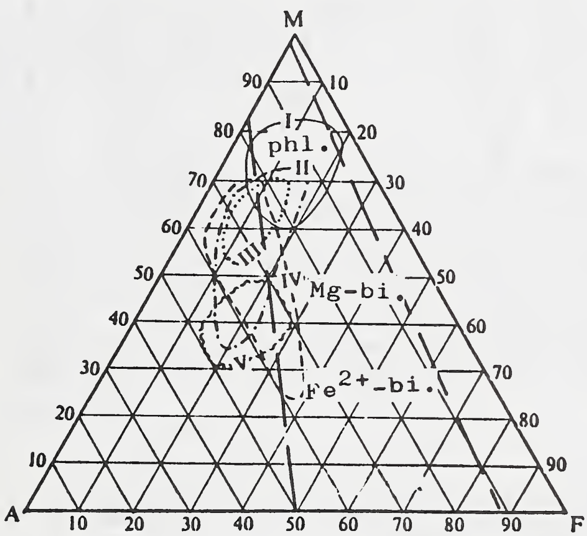

Fig.1 Classification diagram of micas for different occurrences

I-tetraferriphlogopite with reversed pleochroism; II-epigenetic inclusion in diamonds; III- megacryst and macrocryst micas in kimberlites; IV-groundmass micas in kimberlites; V-lamproites (Guizhou and Hubei). (compositional field by Guidotti et al. 1975)

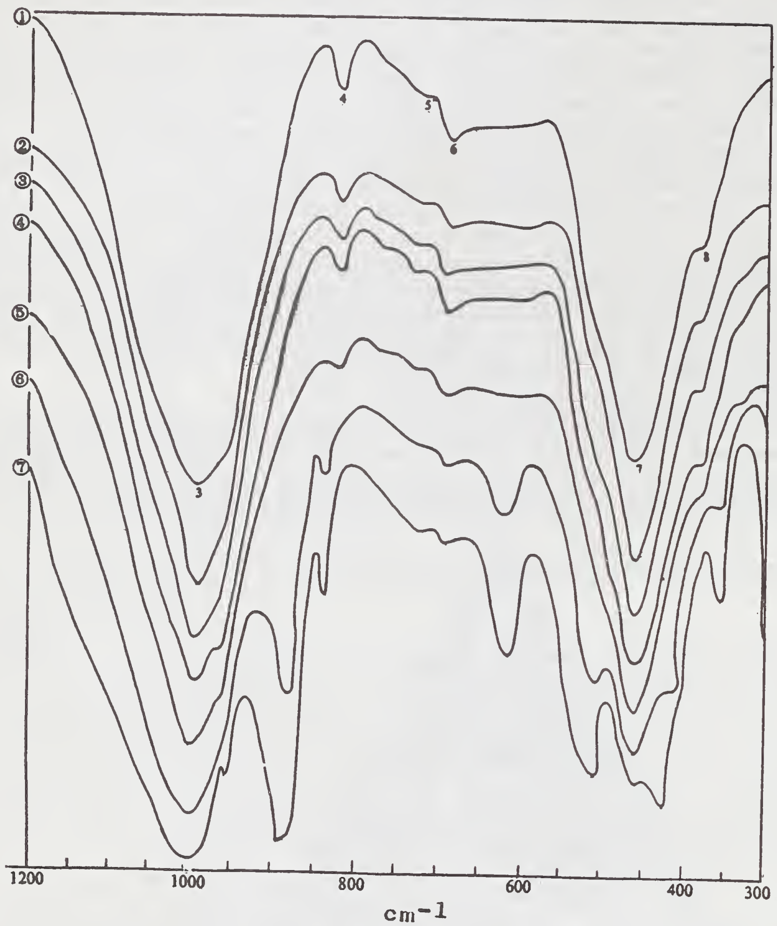

Fig.2 Infrared absorption spectrum diagram of a heating phlogopite

① heatless sample; ② heating 700 °C; ③ heating 800 °C; ④ heating 900 °C; ⑤ heating 1000 °C; ⑥ heating 1100 °C; ⑦ heating 1200 °C