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Ilmenite trends from kimberlites of Siberia :

Do they represent the mantle feeding vein system?

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Ilmenite concentrate from 29 kimberlite pipes of Siberia and some other from Africa (Angola, Gunea) Montana (KL-1, Ashchepkov et al., 2001), Brasilia (Vargem (Ashchepkov et al., 2002)) and several pipes from Angola (Rotman et al., 2004) were studied with EPMA and LAM ICP MS for TRE.

Reconstruction of TP the mantle layering reveals the strong dependence of the major and trace element behavior of the ilmenites (and other minerals) from lithospheric mantle structure.

Long TiO2 compositional trends of pycroilmenites mainly represent vertical channel systems at pre-eruption stage.

The configurations of Ilm trends correlate with the compositional layering if the lithospheric keel being buffered with wall mantle rocks. In essentially eclogite substrate the Ilm are not enriched in Cr2O3 and NiO content but sometimes have high MnO content. In opposite strongly metasomatized peridotite substrate in lower part of mantle sequences is correlating with the high Cr- Ni content of pircotoilmenites.

In general the ilmenite trend is dividing into 4-5 major parts (8-9 according to layer-

ing). The most Ti-Mg-Cr rich (1) is related to the deep seated Hi-T^o metasomatites developed at lithosphere basement by protokimberlite melts. Two units with FeO rise (MgO decrease) refer to P $>$ 40 kbar (2) and upper to garnet facie (3). The divides: deep upper mantle is marked by pyroxenite lens and inflection in Cr2O3-CaO (Sobolev, 1974). Last part of trend (4) with new Cr (NiO) rise means interaction of remaining protokimberlite melts with peridotites. Rare group (5) of Fe Ilm (MgO $\sim$ 4-6) are similar to alkali basalt megacrysts (P $<$25 kbars)

Ilm from the same regions and kimberlite groups display similar trends likely reflecting construction of feeding system and mantle structure.

Differentiated by AFC initial magmas (using KD) show carbonatite signatures (progressive HFSE minima, Sr rise). Eu minima in some Ilm (Kl-1- Colorado; International'naya, Malo – Botuobinsky region) suggest eclogite material in generation of protokimberlites. Fast HFSE rising with REE with decreasing Mg is a result of mainly silicate precipitating: Ol , Gar, Cpx. But in the last stages rising of REE content and near stable HFSE is controlled by Ilm prevailing crystallization with rutile and some minor phases in addition.

Splitting of the Ilm trends on the low and Hi Cr- content is typical for the highly metasomatized mantle columns what possibly means the fractionation of the separate magma portions what means the divergence of the major magmatic channels and the surrounding vein system. The break at the main trend with the developing of the Ferich Low TiO2 ilmenites is likely the result of the vertical protokomberlite melt migration to the garnet –spinel (and probably upper) followed to polybaric fractionation.

REE patterns of Ilm often display the inflection similar to those produced by the chromatographic percolation processes (DePaolo, 1984). These patterns are very similar to those of the spinels. The Y minima are similar or deeper especially enriched in ulvospinel minal. This suggests that ilmenite- parental magmas are often dissolving the peridotites (dunites) with the high amount of spinels. Rarely as was found for Yubileynaya and Zarnitsa pipes ilmenites the REE content is rising with the HFSE decrease what means the essential ilmenite and other heavy element concentrator precipitation. Some Ilm series display REE patters close to garnets -LREE depleted.

TRE found by LAM ICP for diamonds display similar inflected REE and Y fraction anomalies found for Ilm suggesting small octahedral diamond crystallization was influenced by protokimberlites.

In Siberia Ilm trends for Zarnitsa and Osennyaya (Daldyn) divides in 8 groups according to layering. Large metasomatic basement series are found. Long 8- group Alakite Ilm trends show for northern pipes (Komsomolskaya, Sytykanskaya) splitting in Cr

in middle part probably influenced by Cr – dissolution in the peridotite wall rock and the Cr – decrease within eclogite. While the Aikhal and Yubileinaya Ilm trends show continuous Cr rise. Ilm from Novinka pipe (Verhne –Munsky) long lineal trend with abrupt Cr splitting probably is Ti-rich Cr-spinel controlled. .

Mir (M-Botuobia) and close Dachnaya pipes ilmenite trends show exponential decrease MgO and Cr- content in middle part suggesting restricted interaction with peridotites in closed magmatic system. But other nearly located pipes – International'naya, Taezhnaya reveal short crystallization trends while in Amakinskaya it splits to common and Fe – rich groups.

Short TiO2 trend with abrupt MgO, NiO decrease is typical for the Ilm trend from Nurbinskaya pipe. This agrees with chromite trend showing rapid TiO2 increase at (deep) Cr- rich part. Pre- eruption vein system was nearly entirely crystallized in the deep part of mantle column what probably influenced on the high diamond potential.

In Prianabarie several pipes in Dyken (17/3), Ary – Mastakh (Boomerang), Kurannakh (Universitetskaya), show the rather long nearly continuous compositional trends but some other with the higher Cr content in general reveal the splitting on to several groups.

Many pipes in Africa show polybaric fractionation of pycroilmenites with the splitting and developing of Fe – rich ilmenites probably here this is more typical then for the colder lithospheric keels of cratons in Siberian and Slave cratons.

Ilmenite trends seem to be having the direct connection to the exploration volubility of the kimberlites. This work was supported by the Russian Foundation for Basic Research, projects. 99-05-65688, 00-05-65228, 03-05-64146.