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Melt percolation in mantle columns beneath the kimberlite pipes.

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ses of the melt- fluid percolation in each layer of the series of layers compiled to the units are rather specific. In general the following main unit may be recognized from top to bottom:

1. Spinel and spinel-garnet facies usually heated close to primitive composition or silica enriched. 10-20 kbar (I) usually heated sometimes irregularly corresponding the 80-90 mv/m2 geotherm similar to the alkali basalt xenoliths; 2. Upper garnet facie –coarse CaO –SiO2 rich lherzolites 20-35 kbar (II);3 Pyroxenite lens 35-45 kbar (III) heat flow vary from 35-55 mv/m2; 4. Layered harzburgite sequence composed from two-three layers 45-60 kbar (IV) low heated 35-40 mv/m2; 5. Coarse garnet dunite layer with the subduction related eclogites 60-65 kbar (V) is the most cold being sometimes heated; 6. Lower asthenosperic unit (sometimes) composed from sheared – or interacted with melt peridotites and hot pyroxenites 65-75 kbar (VI) rich 1400oC; 7. Lower part of the Lithospheric keel composed from dunites or mixed with the pyroxenites or convective mantle material 75-120 kbar (VII) with subadiabatic PT

conditions.

The uppermost part the peridotite column (I-II) are and is formed due to diapiric ascend from submelted peridotites in range 45-30 kbar. Pyroxenite lens accumulate the water and partial melts due to serpentine dehydration in common TP gradient. The primary subduction sequence are coupled with continental keel mechanically. Dunite layer (Pokhilenko, Sobolev, 1987) is either part of mantle weidge or produced by intensive fluid flow in basement of lithosphere . Sheared asthenospheric peridotites (Nixon. Boyd, 1973) are resulted from the melt impregnation or convective motion as in layer (IIV).

Ther are following melt types.

1. Anatexic melts due to the remelting of the peridotites by the fluid stored at 35 - 40 kbar from the dehydrated slabs and followed by the increase in SiO_2, Al_2O_3, CaO -alkalis contents.

2. The subduction- related fluids – melts independently rising from the slabs due to serpentine decomposition near 40 of the oceanic types accompanied by Na-Fe metasomatism.

3. The kbars in case of oceanic subduction or lower in continental margin environment.

4. at 70 kbar – following by the decomposition of K- richterites and phlogopites

5. Deep plum ultramafic kimberlite-related melts usually stored at the 200 boundary at the ultramafic melt density inversion (Agee, 2000)

6. Light highly differentiated carbonatite protokimberlte melts derived from the evolved ultramafic primitive kimberlites melts and created the pre-eruption feeding system in the mantle column.

7. Basaltic melts derived from the 660- and upper horizon, and their various hydrous differentiates. They are simply crossing the 200 boundary but the stops at the 35 40 kbars interacting with the pyroxenite lenses and the most light and fluids rich melts easy follow up to 30-25 asthenospheric trap by the minimum at peridotite solidus causing the effective Fe- Al enrichment.

8. The anatexic melts born in diapirs started at 35-45 and elevated to the 19-12 kbars enriching the roofs of diapirs and the phase boundaries. Some or many diapirs are initiated by more deep plum melt intrusion associated with the melt impregnation and various type of interaction.

9. Various hybrid melts produce by the two - three types of the initially plum- born melts with the pyroxenites and hydrous metasomatites concentrated in the phase boundaries – and tops of the slabs layers.

The growth of the continent is coupling of the new layers due to underplating is flowed by the intrusion of the plum melts filled the asthenospheric horizons at the melt –solid density inversion and tearing the slabs usually with the period of about 60 ma or multiplied what brings to the bended structure of the lower horizons.

The processes of the melt percolation refer to several types 1. Ancient pervasive subduction processes with the enrichment in SiO2, Pb, U in case of oceanic subduction, and LILE, Th, sometimes HFSE in case of the (lamproitic type). Subducted eclogites layers containing sediments can follow by more effective HFSE enrichment.

2. Plume kimberlitic melts are developing near the rising feeding system where the megacrystalline associations are developing. Very often large vein formation is accompanied by the intensive AFC process taking place in the contact zones that may be rather wide due to the high amount of the volatile components. The structure of the feeding system depends of the general layering of the mantle column forming the intermediate magmatic chambers near the top pf the units and layers. The upper part of the this vein system usually became branching with the more intensive interaction of the Direct impregnation of the carbonatites and kimberlites melts brings to essential CaO and Sr enrichment usually with HFSE dips. 4. Basaltic melts concentrated mostly at the upper part of the lithosheric mantle columns produce local Fe- metasomatism near the levels of their concentration mostly in the upper asthenopheric layer (35-20 kbar). Evolved basaltic melts may also produce the megacrystalline associations in the upper part in case of the multilevel magmatism what is common for the kimberlite regions. Geochemically these are manifested by the siderophile group enrichment and creation of the rounded patterns of REE and close to the primitive spidergrams of the minerals. 5 Hybridism of the in large scale is developing mainly in the pyroxenite lens near 40 kbars due to the interaction of the various plum melts with the hydrous peridotites and pyroxenites concentrated there. This is followed by the creation of Na-Al–Cr rich pyroxenites and associations in interval seem to be 30-45 kbars. Diapiric ascend of the peridotites enriched in the melts. Large scale metasomatism due to the thermal impact of the (mainly) kimberlite plume at the basement of the lithosphere with the decompositions of some hydrous minerals and developing of the metasomatic minerals and associations within the rather large mantle column volumes and may cat through the structure of the units. This may be continuous with the HT and LT metasomatic associations taking place in the same peridotites when garnets pyroxenes and accessory mica- amphiboles can growth in the different temperature intervals or mul-

tistage process. Possibly the location of the kimberlite fields at the distance of about 120 km reflect the rise of the flame – like fluid flows and metasomatic columns what is similar to the processes taking place in the island arc with the creation of andesitic volcanoes at the volcanic front located on the decomposition boundary of amphiboles at 120 km depth.

According the type of the primary subduction slabs their depth in the mantle column and of and geodynamic environment of the tectonic terrains the dominated processes with the mantle columns vary in high scale. In the outer parts of the continental keels are very of ten rather depleted with e the dominated dunite harzburgite associations in the upper and lower units and hybrid rocks within the middle horizons. The marginal parts of the continents reflect the dominated oceanic subduction processes with the creation fine layered structure. Going to the inner part the situation became more complicated with the difference of the geochemical specialization of the separate levels and units that may be of continental and oceanic subduction type. The involving of the sedimentary layers with the thick eclogite horizons may be also characteristic for the marginal parts of the cratons. The inner parts of the cratons reveal the more coarse structure reflecting the processes in the mantle corresponding to A-subduction.

Sometimes most deep continental keel lithosphere parts also recognized to 400 km in the central part of cratons reflect the ancient ultra depleted roots of the continents than remains stable for the long time (VII). The convective mantle mineral assemblages close to primitive type with the small enrichment in HFSE and relatively flat REE patterns. Sheared Fe peridotites (VI) show the either primary depleted features with the Fe-Ti-Na enrichment what refer to the plume melt interaction or to the Ca–Al-Si metasomatism.

Depleted dunite layer (V) having high Ga/Px ratios reveal highest La/Yb ratios for the minerals with the deleted HFSE, LILE. Layered lower unit (IV) reveal various characterictics depending on the primary nature of subduction layers. The pyroxenite lens (III) is either rich in LILE group in case of Phl metasomatism or reveal hybrid nature. Upper garnet facie (II) reveal usually slightly depleted nature. Spinel facie (I) commonly is subjected to Fe- metasomatism.

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