5.7.25

Chemical and textural characterisation of modal metasomatism in peridotite xenoliths from Marsabit volcanic field (Kenya rift)

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Preliminary results of textural and compositional analysis of different petrographic groups of peridotite xenoliths (hosted by alkali basalts from Marsabit, Northern Kenya), show indications of both chemically and texturally varying metasomatic assemblages.

In many spl lherzolites, spl-opx-cpx symplectites along with core (trace element) compositions of primary clinopyroxene indicate the former presence of garnet. Ti-pargasite often associated with symplectite indicates metasomatic replacement of clinopyroxene and is depleted in LREE compared to HREE. Additionally it shows high Ba/Th and Nb/U ratios and small positive Sr and Ti anomalies. Granuloblastic samples often contain 'melt pockets' associated with symplectites. They consist of brown, Ti-rich silicate glass (about 52 wt% SiO_2) and secondary microphenocrysts (Ti-augite, chromite and olivine). The trace element patterns of the glass mirror the composition of Ti-pargasite, suggesting an origin by partial melting of this amphibole (+ clinopyroxene?).

Porphyroclastic spl lherzolites and spl harzburgites show no textural evidence for the former presence of garnet. Modal metasomatism is very abundant. Ti-poor amphibole, phlogopite (both in close association with relictic primary spinel) and apatite (Na, Sr and Ce-rich) are replaced by melt pockets consisting of colourless silicate glass and microphenocrysts (Na-rich Cr-diopside, chromite olivine, carbonate and apatite). Compared to brown, Ti-rich glass, colourless glass has higher SiO_2, alkali and Al_2O_3 contents, and lower CaO contents. Ti-poor amphibole is strongly enriched in LREE, Th and U and exhibits marked negative Hf, Zr, and Ti anomalies. Trace element patterns of glass and Na-rich Cr-diopside mirror the composition of the 'older' assemblage (Ti-poor amphibole and apatite), indicating (melt/fluid induced?) melting of the latter. The occurence of carbonate and apatite coupled with the trace element characteristics of colourless glass (e.g. low Zr/Sm and Ti/Eu) and diopside (high La/Yb and low Ti/Eu) raises the question if some metasomatism in this textural group was related to carbonatitic melts.

5.7.26

Petrology and geochemistry of mantle xenoliths from Santiago, Cape Verde Islands

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New mineralogical, textural and geochemical data are presented on a suite of spinel peridotite xenoliths from the island of Santiago, Cape Verde, collected from the early shield-stage volcano complex (Miocene-Pliocene) in the Riberia de Barca region. Three distinct types of xenoloith have been identified: Type I have Fo ranges from 89 - 91, clinopyroxenes Mg#'s from 90 - 93.4 and clinopyroxene Na_2O abundance ranges from 0.4 - 0.77 Wt%. Type II have wider Fo ranges (87 - 92) and clinopyroxene Mg#'s (89 - 93.4) with clinopyroxene Na_2O abundances of 0.4 – 1.77 Wt %. Type III samples have similar Fo ranges to Type II, but have much wider variation in clinopyroxene Mg#'s (78-92) and Na_2O abundances in clinopyroxene (0.4 – 2.1 Wt%). The presence and distribution of apatites varies across the three groups: Very few apatites occur in type I and only in the silicate phases; small numbers of apatites (SrO < 0.9 Wt%) occur in type II and abundant apatites (SrO > 1.0 Wt%) occur in the glassy/melt zones in type III. The spinel phases vary across the three types with type I having only Cr-Al rich phases, type II with primary Cr-Al rich phases and small numbers of Fe-Ti phases and type III having both Cr-Al rich and abundant Ti-Fe phases.

Optical mineralogical observation shows a partially metasomatised orthopyroxene in one xenolith from the type III group being altered to sodic clinopyroxene and high fosteritic olivine and glass with associated apatite. These compositional and mineralogical observations indicate the suite contains the unmetasomatised depleted protolith (type I), a midly metasomatised group (type II) and a strongly metasomatised group (type III). It is proposed that the metasomatising agent was a carbonatitic melt. Decarbonation reactions during ascent caused relacement of orthopyroxene by jadeitic clinopyroxene and fosteritic olivine with apatite after Yaxley et al [1].

References

[1] Yaxley G.M., Crawford A.J., Green D.H., (1991) *EPSci.lett* **107,** 305 - 317.