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K-rich Glasses from the Oceanic Mantle of Cape Verde

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Numerous mantle xenoliths were recovered from two lower Tertiary necks of the Sal Island (Cape Verde Archipelago). They are mainly constituted by spinel-bearing lherzolites, harzburgites and subordinate wehrlites. Protogranular textures with superimposed different types of metasomatic reactions are very common. The protogranular textures are characterised by curvilinear grain boundaries, with large olivine (0.5-1mm), orthopyroxene (0.5-1mm) and clinopyroxene (1-2mm) crystals. Spinels are typically interstitial, with smaller size (<0.5mm), and very scarce in modal abundance (<1vol%). On the basis of textural relationships, modal abundance and grain size of primary and secondary parageneses, three metasomatic textures can be identified: Type A characterised by a secondary assemblage of small crystals of olivine, clinopyroxene, spinel, feldspar (only in one xenolith) and glass in decreasing order of abundance, surrounding orthopyroxene (sometimes in contact with spinel). Type B characterised by abundant glassy patches, surrounding (or inter-digitated with) clinopyroxene (often spongy), olivine and tiny, sub-idiomorphic spinel. Type C characterised by a spongy rim around clinopyroxene, which, in some cases, can involve the whole crystal. Thermobarometric estimates were calculated using the two-pyroxenes and the olivine-clinopyroxene geothermometers of Brey & Köhler (1990), and the geobarometer of Köhler & Brey (1990). Temperatures on primary mineral assemblages are in the range 1210-1240 C, coupled with pressures ranging from 13 to 18 kbar; lower temperatures were determined for metasomatic domains (932-1182 C). fO_2 estimates were obtained using the ol-opx-cpx equilibrium (Luth & Canil, 1993). The calculated values reveal a slight tendency towards more oxidation conditions in the metasomatic domains (Δlog fO_2 -3.4:+0.94) with respect to the primary assemblage (Δlog fO_2 -3.6:-0.78). Primary clinopyroxenes present lower SiO_2 and CaO and higher Al_2O_3 contents, with respect to clinopyroxenes in secondary parageneses. In chondrite-normalised incompatible element diagrams, the former present nearly flat patterns ($(La/Yb)_N$ = 0.95-1.34) and slight Ti and Zr negative anomalies, while the latter are more LREE-enriched ($(La/Yb)_N$ = 1.06-11.3) and present more pronounced Ti and Zr negative anomalies. Glasses exhibit rather uniform compositions, even within different xenoliths, with SiO_2 contents ranging from 58.6 to 69.6wt%, coupled with very high K_2O contents (7.15-9.24wt%) and very low Na_2O/K_2O ratios (0.33-0.85). TiO_2 contents vary from 0.42 to 1.67wt%, only two glass compositions reaching 3.2wt%. In chondrite-normalised incompatible element diagrams, glasses are remarkably enriched in Rb (65-165ppm) with a $(La/Yb)_N$ varying from 19.6 to 37.0, and negligible Zr and Ti negative anomalies. The most interesting characteristic of these glasses is their remarkably high potassium content. This represents a peculiar chemical composition in oceanic environment, and they are among the K-richest world-wide, also including glasses from continental setting. It is well known that lavas with potassic character are rare in oceanic environment, and they are totally absent, to the best of our knowledge, in Cape Verde Archipelago. Thus, the nature and provenance of the metasomatic melts responsible for Cape Verde glasses are quite puzzling. As a preliminary approach, major element mass-balance calculations were used considering primary paragenesis plus a hypothetical metasomatic melt which give rise to secondary paragenesis plus glass. Good results were obtained using a composition very close to a K-lamprophyre, having a K_2O and Na_2O contents >3.44 and <3.85 respectively. The calculated primary and secondary mineral percentages were then used for carrying out the incompatible element patterns of the hypothetical melts, with results very close to the real incompatible element composition of the K-lamprophyre. P-T and fO_2 conditions of Cape Verde mantle xenoliths, as well as their peculiar glass compositions, are compared with other mantle suites from both oceanic and continental settings. In particular, the Gran Comore mantle glasses, with extremely high Na_2O contents (up to 13wt%; Coltorti et al., 1999) are used to define the sodic end-member of glass compositions, which in turn, may suggest a wide spectrum of metasomatic agents.

Brey GP, Köhler T, *J.Petrol.* **31**, 1353-1378, (1990).

Coltorti M, Bonadiman C, Hinton RW, Siena F, Upton BGJ, *J.Petrol*, **40**, 133-165, (1999).

Köhler T, Brey GP, *Geoch.Cosmoch.Acta*, **54**, 2375-2388, (1990).

Luth RW, Canil D, *Contrib. Mineral. Petrol.*, **113**, 236-248, (1993).