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Petrological features of anhydrous and hydrous mantle xenoliths from Harrow Peaks, Antarctica

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A preliminary study on the petrological features of a new xenoliths population, collected in the area of Harrow Peaks (HP) Northern Victoria Land, Antarctica is presented. The presence of modal hydrous phases (amphibole and rare phlogopite) allows to explore the water circulation and volatile reservoirs of this mantle domain. HP samples are medium to coarse grain peridotites, protogranular to phorphyroclastic in texture. They vary in composition from fertile lherzolite to harzburgite. Both anhydrous and hydrous peridotites show matrix/melt interaction forming secondary minerals and resorbed rims in primary olivines and spongy textures or cloudy rims of the other peridotite minerals. Opx occur as large crystals (opx1) with thin and resorbed spongy rims or texturally well equilibrated small, elongated grains (opx2). Primary unmetasomatized cpx are rare, the majority is spongy, resorbed grains or newly formed small crystals. Spinel (sp) always occur as small anhedral crystals, or larger, often dendritic primary grains. Amphibole occurs both as disseminated and in veins; the latter frequently associated with newly formed, secondary cpx crystals (Coltorti et al.,2004). Glassy patches are rare, not associated with amphibole, but occur related to resorbed/spongy cpx and spinel(sp).Mineral and glass major element analyses evidence that HP peridotites are following a residual trend, but are characterized by low mg#[=100*Mg/Mg+Fetot]values. Fo in primary unmetasomatized olivine range between 87.49 and 89.07 reflecting an anomalous fertile character respect to the lithological type (PM ol: Fo= 89.5). CaO(< 0.1 wt%)and NiO(0.28 to 0.41 wt%) contents are in the range of variably residual mantle values. In term of mg# values (87.24 - 89.56),opx1 and opx2 are coherent with primary ol. Both types show a narrow range of variation in terms of $Al2O_3$(2.11-3.32 wt%), TiO_2(0.05-0.14 wt%) and CaO(0.36-0.96 wt%). Spongy rims and resorbed crystals in both olivine and opx record a sensible enrichment in iron contents, accompanied (opx1 rim) by relevant depletion in $Al2O_3$ and CaO. Primary and unmetasomatized portions of spongy cpx preserve primary residual chemical features in terms of mg#(89.19-90.87) and $Al2O_3$(3.50-4.50 wt%), whereas TiO_2 is anomalously high (0.47-0.6 wt%). In spongy and secondary cpx, effects of metasomatism at depth is evidenced by relatively higher mg# and low to very low TiO_2 and $Al2O_3$ contents, while the interaction with the host basalts univocally is testified by a coherent trend of the same elements. Sp follow the expected negative correlation between cr# [= Cr/(Cr+Al)*100 mol] and mg#, beside the strong textural evidence of matrix/melt interaction. Amphibole are pargasites (mg# 87.2-89.5) relatively homogeneous in composition with TiO_2 ranging from 1.65 to 2.53 wt%. The few data so far available indicate T in the range 940 -1194 °C and relatively low condition of Δlog FMQ (-1.11; -0.25),comparable to the nearby hydrous xenolith locality of Baker Rocks. As already suggested by Bonadiman et al.(2014)the presence of amphibole do not necessarily mean high oxidation conditions.
References:
Bonadiman et al., (2014) CMP, in press
Coltorti et. al., (2004) Lithos 75, 115-139