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# Amphibole genesis in Harrow Peaks mantle xenoliths and its role in the petrological evolution of Northern Victoria Land subcontinental lithospheric mantle

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A petrological study of hydrous and anhydrous mantle xenoliths from Harrow Peaks, Northern Victoria Land (Antarctica) has been carried out, aiming at mapping the evolution of this lithospheric mantle domain and to better constrain the formation of the hydrous phases, in particular amphibole.
Samples vary in composition from lherzolite to harzburgite with textural evidences of matrix/melt interaction (secondary minerals and spongy textures). Olivine and orthopyroxene are mainly present as large primary grains, whereas clinopyroxene can also occur as resorbed grains or newly formed small crystals, often associated to glassy patches. Spinel is present as small anhedral crystals or larger dendritic grains. Amphiboles occur both as disseminated and in veins; the latter frequently associated with secondary clinopyroxenes and spinels.
Considering fusible element content in orthopyroxene (i.e. $Al2O_3 \sim 2.50$ wt.%), Harrow Peaks lithosphere domain reflects a relatively residual character. On the other hand, the presence of "convex upward" clinopyroxene -REE pattern, as already observed in clinopyroxene from mantle xenoliths of the nearby Greene Point (Pelorosso et al., 2016), together with their LREE enriched content (LaN from 9 to 30), suggest that Harrow Peaks lithospheric mantle was variably affected by enrichment processes, i.e. refertilisation and metasomatism.
Amphiboles from Harrow Peaks can be classified as kaersutite, magnesio-hastingsite, and ferri-kaersutite with pretty high $TiO_2$ contents (2.74 wt% 5.30 wt%, Gentili et al., 2015); they present variably enriched trace element patterns (LaN from 12 to 56, LaN/YbN from $\sim$1 to $\sim$5).
Compared with the nearby amphibole-bearing xenolith area of Baker Rocks (Coltorti et al., 2004; Bonadiman et al., 2014), Harrow Peaks amphiboles, present a lower enrichment in $TiO_2$ and LREE that may be related to an incipient stage of peridotite/melt interaction. This fact may also justify the different geochemical features of amphiboles, that in some cases do not mimic the REE pattern of clinopyroxene suggesting still incomplete attainment of the equilibrium conditions.
This is also suggested by the fugacity values calculated on the basis of the anhydrous parageneses ($\Delta$log $fO_2$ (QFM) -2.78 to -0.24) that strongly deviated from those obtained from amphibole dehydration equilibrium, applying the dissociation reaction, that record extremely oxidizing conditions ($\Delta$QFM = +5; + 6.8; Gentili et al., 2015), at T varying between 800 to 1100° C (Ballhaus, 1991). This decoupling is not observed for Baker Rocks amphibole –bearing peridotites, where both methods converge to the values of $\Delta$QFM $\sim$-1.78 (Bonadiman et al., 2014).

References

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