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Metasomatism in the Hyblean upper mantle: evidence from pyroxenes and glass in peridotite xenoliths

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Basaltic diatreme pipes and lava flows from the Hyblean Plateau (Sicily, southern Italy) host large numbers of upper mantle xenoliths. Spinel-facies peridotites (depleted lherzolites; Fo_{89-91}, En_{88-91}, Cr-Diopside: $En_{48-49}Fs_{4-6}Wo_{45-48}$, Cr-rich spinel with *cr* = 25-39) represent the dominant type. Mineral and whole-rock chemistries suggest their depleted character. Nevertheless there are evidences of cryptic (common) and modal (rare) metasomatism, revealed by the incompatible element enrichments of xenoliths (La_n/Yb_n = 4-24) and pyroxenes, and by the occurrence of phlogopite and fresh trachybasaltic glass vein.

Rare Earth Elements (REE) patterns in clinopyroxenes from spinel peridotites show different shapes: i) LREE enriched (La_n/Yb_n = 7-17) ; *ii*) U-shaped (La_n/Sm_n = 21-34; Sm_n/Yb_n < 1); *iii*) near-flat (La_n/Yb_n $\sim$3), that may be associated to distinct metasomatic events after partial melting event(s) (estimated in 10-14% basing on spinel composition). Orthopyroxene always shows increasing REE content from LREE to HREE. The presence of marked Pb, Nb and Ba positive anomalies in PM-normalized incompatible element diagrams for pyroxenes likely indicates contamination of crustal component.

The trace elements composition of liquids estimated to be in equilibrium with the clinopyroxenes are compatible with the Hyblean Upper Miocene lavas (also in case of metasomatic episodes occurring shortly after melt extraction), but are not related to the trachybasaltic vein, as proven by mass balance calculation and selective trace element relationships as LILE/HFSE (e.g. Ba/Nb) and LILE/LREE (e.g. Ba/La). On the other hand, the glass freshness indicates that the veining process must have occurred

just prior to the xenolith entrapment into the host magma and the rapid ascent to the surface.

Pressure-temperature estimations yields 1-1.2 GPa and 752-1070˚C, supporting that metasomatic episodes occurred at Crust-Mantle boundary or just below.

Given the above considerations, two types of metasomatic episodes can be recognized in the studied peridotites: (1) metasomatic re-equilibration with a liquid akin to the Upper Miocene host basalt and (2) infiltration of liquid unrelated to the Upper Miocene host basalt. Both metasomatic agents may be moderately influenced by the contribution of a crustal component at mantle depth.