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Petrological and geochemical constraints on the composition of the lithosphere beneath the Syrian rift

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Mantle xenoliths were carried to the surface by alkaline basalts forming the neogene-quaternary massif of Jabel El Arab (south of Damascus). The xenoliths suite can be subdivided into two types: 1- xenoliths of type I (spinel$\pm$amphibole$\pm$phlogopite-bearing lherzolite, harzburgite and wehrlite). 2- xenoliths of type II (garnet- and sapphirine-bearing meta-magmatite, garnet-bearing meta-magmatite and spinel-bearing pyroxenite). Type I xenoliths are equilibrated in the spinel peridotite field at temperatures between 900-1100 $^{\circ}$C whereas Type II xenoliths are equilibrated between 900 -1000 $^{\circ}$C for pressures ranging between 12.5-14 Kb. In type I peridodites, major elements of pristine minerals and trace-element compositions of clinopyroxene determined by LA-ICP-MS indicate that the lithospheric mantle experienced relatively low degree of melt extraction. However, some type-I xenoliths display discrete pockets of cpx$\pm$ol$\pm$amph$\pm$glass surrounding spinels. The clinopyroxene in those melt patches often has spongy rims and has variable mg# (89.5- 93.6) and concentrations in major elements (especially Al_2O_3 $<$7.3 wt%, Na_2O $<$2.3 wt% and Cr_2O_3 $<$3.6 wt%). Such clinopyroxenes display high abundances of the most incompatible elements (Th, U, Sr) with a strong LREE enrichment ($[La/Sm]_N$ < 9.5), but low abundances of HFSE (Nb, Ta, Zr, Ti). The major element compositions of the glass are homogenous and have a trachy-andesitic composition, with relatively high SiO_2($<$60 wt%),

Al_2O_3 ($<$22.5wt%) and Na_2O ($<$9.2 wt%), but low TiO_2 and FeO concentrations.

Petrographical, mineralogical and geochemical data suggest that the occurrence of melt pockets and the high trace-element contents of some clinopyroxenes can be attributed to the percolation of small volume melt fractions in the upper mantle beneath the Syrian rift. Those small melt fractions resemble in their trace-element characteristics of originally CO_2-bearing alkaline melts that evolved to carbonate-rich melts through percolation-reaction with the Syrian lithospheric mantle.