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Nature and evolution of the lithospheric mantle beneath the passive margin of East Oman: evidence from mantle xenoliths sampled by alkaline lavas.

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Alkaline lavas from North West Al Ashkharah (East Oman) contain numerous very small (Ń2cm) mantle xenoliths. These xenoliths never studied in detail before provide the unique opportunity to investigate the nature and evolution of the upper mantle beneath the Oman passive margin which display a rift system in the studied area.

Porphyroclastic to granular spinel lherzolites and harzburgites are predominant and only few clinopyroxenites have been found. These xenoliths never display amphibole and phlogopite. Composition of clinopyroxenes, orthopyroxenes, olivines and spinels indicate that these samples are witnesses of a typical subcontinental lithospheric upper mantle beneath a rifting system.

The clinopyroxene major element compositions evidence an evolution from fertile lherzolites (Mg#: 89 and Al_2O_3: 7.5%) to refractory harzburgites (Mg#: 93.5 and Al_2O_3: 2.5%). The incompatible trace element content of clinopyroxene allow to distinguish three different types of peridotites: (1) Type 1 is characterized by spoon-shaped REE patterns (Ce_N/Yb_N: 0.07-10.77; Ce_N/Sm_N: 1.2-8.6; $Sm_N/Yb_{N:}$0.05-1.3); (2) Type 2 display LREE-enriched patterns (Ce_N/Yb_N: 4-8.6; Ce_N/Sm_N: 1.4-3; $Sm_N/Yb_{N:}$2.7-6) and (3) Type 3 is characterized by LREE-depleted (Ce_N/Yb_N: 0.4; Ce_N/Sm_N: 0.5; $Sm_N/Yb_{N:}$0.8). Type 1- and 2- clinopyroxenes are similar to those of peridotite xenoliths from Spitsbergen (Ionov et al., 2002).

We therefore propose a similar two steps model for the evolution of the lithospheric peridotitic mantle beneath the rift zone located on the passive margin of East Oman: (1) melting processes of various degrees (up to 20-25%) and then (2) metasomatic pro-

cesses of these upper mantle residues related to the circulation of carbonated alkaline mafic silicate melts.

Ionov, D.A., Bodinier, J-L, Mukasa, S.B. and Zanetti, A., 2002. Journal of Petrology 43:2219-2259.