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Petrological and geochemical study of late-orogenic mantle garnet pyroxenites. Implications on magmatism in old orogenic regions.

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The petrological and geochemical study of garnet bearing pyroxenites from four localities (FMC, Morocco, Jordan, Cameroon) demonstrates that these rocks are cumulates crystallised in the lithospheric mantle domain. Metamorphic reactions, exsolutions and trace elements WR analysis demonstrate that their crystallisation pressure ranges between 1 and 2GPa (30 to 60km). The elaboration of the PTt paths for the studied samples attests of important movements in the respective lithospheres. Replaced in the geodynamical contexts, the samples are interpreted to represent the crystallisation of melts formed during exhumation of orogenic domains. Radiogenic isotopes (Sr-Nd) show that in a very same region, the samples are isotopicaly heterogeneous but are similar to the respective regional lithosphere. Initial isotopic ratios lead to propose that the FMC samples have crystallised at the end of the Hercynian orogen and that the samples from the other localities (Morocco, Jordan and Cameroon) have crystallised at the end of the Pan-African orogen. After recalculation at the crystallisation time, the isotopic compositions are in good agreement with the respective regional lithospheres ones and so samples of this study could represent the product of the melting of these lithospheres. The analyses of oxygen stable isotopes allow to precise the model; they show that twelve of the samples come from the melting of a lherzolitic mantle and that the four others come from the melting of a heterogeneous mantle formed of lherzolites

and eclogites. The presence of some hydrous minerals such as amphiboles and micas and the trace elements WR analyses show that some of the samples were affected by a late metasomatic event.

Results of our study show that thermal relaxation following orogenic events lead to the crystallisation of pyroxenites in the lithosphere. The presence of lage amounts of mantle pyroxenites in old orogenic regions confers physical and chemical particularities to these domains. Among others, global solidus temperature of the whole lithospheric domain will be lowered; it follows that old orogenic regions such as FMC, Morocco, Jordan and Cameroon represent more fertile lithospheric zones in which magmatic activity will be facilitated.