Is metasomatism a global mechanism at the lithosphere-asthenosphere boundary?

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Xenoliths and xenocrysts sampled by *petit-spot* volcanoes provide important new information about the nature and the processes associated with the evolution of oceanic lithospheric mantle. Here, we report the presence of a gt xenocryst and peridotite xenoliths in *petit-spot* lavas from Japan, which call into question the formation of oceanic lithosphere as simple depleted residue after MORB extraction. Firstly, Low-Cr, low-Ti gt xenocryst (Py_{62}, Gr_{20}, Alm_{18}) is interpreted as formed during subsolidus cooling of pyroxenitic or gabbroic cumulates indicating garnet formation at the periphery of the Pacific mid-ocean ridge. It is the first time that such processes are documented in fast spreading context. Secondly, the trace element signature of cpx from *petit-spot* xenoliths characterized by high U, Th, LREE concentration and relative depletion in Nb, Pb, Ti and HREE shows unexpected similarity to melt-metasomatized gt-peridotites sampled by kimberlites (Grégoire *et al*, 2003, JPet 44, 629-657). This similarity suggests that metasomatic processes at the lithosphere–asthenosphere boundary could be a global mechanism in oceanic and continental setting. Grégoire and co-authors interpret the metasomatic signature recorded in xenoliths from South Africa as evidence for percolation of kimberlitic melts across the cratonic lithosphere. As *petit-spot* lavas are characterized, as kimberlitic melt, by K- and CO_2-rich composition, this opens new perspective to understand the generation of *petit-spot* lavas and to constrain melt-peridotite interaction in the deep part of the lithosphere.