Astenospheric processes beneath the ultraslow Smoothseafloor region in the eastern South West Indian Ridge

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Mantle melting at ultraslow spreading ridges is constrained by the low potential temperature and thicker-than-normal LID that limits the extent of the melting column. As a result very small amounts of melts are produced inhibiting the formation of a "normal" oceanic lithosphere and leading to a purely tectonic seafloor extension dominated by serpentinization: the recently investigated Smoothseafloor type spreading (Sauter et al., 2013). At depth the reaction of very small amounts of percolating melts and host asthenospheric mantle leaves traces of the melt/rock reactions as incomplete mineral replacement and strongly variable modal distribution at short scale (dm). Enstatitic, and to a less extent diopsidic, pyroxenes appear to be repeatedly dissolved and recrystallized leaving poekilitic pyroxene and spinel leftovers. Melts enriched in incompatible elements are possibly generated in the garnet field then reacting with the rock under near-batch conditions, i.e. at low rates of melt extraction with respect to the actual rock porosity (Brunelli et al., 2014). Prolonged pyroxenes' dissolution-recrystallization results in enhanced enrichment of the most incompatible elements in the percolating melts that only occasionally are extracted from the system. As a consequence Na (and LREE) countertrends with the melting indicators as mineral Cr# and concentration of the moderately incompatible elements (HREE, HFSE). Accordingly the associated basalts are characterized by a strong Na enrichment and compositional trends separated from those generated in the surrounding regions.

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