Na-CO_2 rich metasomatism beneath the Kerguelen oceanic plateau (South Indian Ocean)

G. DELPECH [1,2], M. GREGOIRE [1,3], J.Y. COTTIN [1,2], S.Y. O'REILLY [1],G. MICHON [2] AND B.N. MOINE[2]

[1] GEMOC ARC National Key Centre, Earth and Planetary Sciences, Macquarie University, NSW, 2109, Australia (www.es.mq.edu.au/GEMOC) (gdelpech@els.mq.edu.au)
[2] Department of Geology-UMR 6524 "Magmas et Volcans", University of JeanMonnet, 23, rue du Dr. P. Michelon, F-42023 Saint-Etienne Cedex, France
[3] UMR 5562 "Dynamique Terrestre et Planétaire", Observatoire Midi-Pyrénées, 14, Avenue E. Belin, 31400 Toulouse, France

Harzburgitic xenoliths have been found in a tholeiitic-transitionnal dyke from the NW Loranchet Peninsula (Kerguelen Islands) where magmatism appears to be the oldest on the islands. These rocks show protogranular to poikiloblastic microstructures where olivine grains (up to several centimeters) may contain orthopyroxene inclusions. Orthopyroxene displays irregular forms with curvilinear grain boundaries and clinopyroxenes are rare and small around orthopyroxcne-spinel clusters. Two rocks dipslay vermicular reacted spinel surrounded by low Ca-spongy clinopyroxene + Na-rich feldspar ± olivine II ± small apatite. Felspar compositions evolve from $An_{32-37}Ab_{61-64}Or_{2-3}$ to $An_{14-23}Ab_{74-83}Or_{2-4}$ in the most reacted felspar-bearing sample.

Whole-rock and consituent mineral major element compositions ($Mg\#_{Ol}$= 90.7-92.2, $Mg\#_{Opx}$=91.5-93, $Mg\#_{Cpx}$= 91.4-94.8, CaO_{WR}< 1wt %, Al_2O_{3WR}< 1.03wt %) and very low trace-element contents are among the most depleted mantle samples from the Kerguelen xenoliths suite. These refractory compositions provide evidence for these xenoliths to be residues of an extensive partial melting event.

However, the LREE enrichments as shown by whole-rock and clinopyroxene trace element patterns require incompatible trace element addition by metasomatic agents. Most of whole-rock and clinopyroxene trace element contents can be ascribed to percolation of various amounts of basaltic melt with associated melt/rock reaction processes. Nevertheless, trace element contents of the spongy clinopyroxene closely associated with the Na-rich feldspars exhibit one of the largest LREE enrichments among Kerguelen xenoliths (La/Yb_N= 12.38-13.37), Th, U and Sr enrichments, together with very low HFSE contents (e.g Ti, Zr, Hf, Nb, Ta). Crystallisation of this unusual metasomatic assemblage is likely to be the result from infiltration of small volumes of volatile and Na-CO_2 rich fluids percolating through the depleted peridotitic matrix, followed by reaction and crystallisation processes. This leads to selective extreme trace element enrichments of previously very depleted oceanic mantle on a very small scale (i.e < mm scale). Further understanding is needed to evaluate possible relationships with the petrogenesis of carbonatitic magmas in an Albite-Calcite ($NaAlSi_3O_8$-$CaCO_3$) system.

Trace element and isotopic evidence for subduction-related carbonate-silicate melts in mantle xenoliths from the Pannonian Basin, Hungary

DEMÉNY, A. [1], VENNEMANN, T.W.[2], HEGNER, E.[3], EMBEY-ISZTIN, A.[4], HOMONNAY, Z.[5], MILTON, J.A.[6]

1 Laboratory for Geochemical Research, Hungarian Academy of Sciences, Budapest, Budaörsi út 45., H-1112 (demeny@sparc.core.hu)
[2] Institute for Geochemistry, University of Tuebingen, Wilhelmstr. 56, Tübingen, D-72074, Germany
[3] Institute for Mineralogy, Petrology and Geochemistry, University of München, Theresienstrasse 41/III, D-80333 München, Germany
[4] Department of Mineralogy and Petrology, Hungarian Natural History Museum, Budapest, Ludovika tér 2., H-1431 Pf. 137.
[5] Department of Nuclear Chemistry, Eötvös Loránd University, Budapest, Pázmány P. s. 2, H-1117, Hungary
[6] School of Ocean and Earth Science, Southampton Oceanography Centre, European Way, Empress Dock, Southampton, SO14 3ZH, UK

Carbonate globules, interpreted as carbonatitic melt, occur in peridotite xenoliths of Plio-Pleistocene alkali basalts from the Carpathian-Pannonian region. The carbonate globules are hosted in amphibole-bearing glass veins within sheared peridotite xenoliths of Szentbékálla, Balaton Highlands, Hungary, a well-studied locality of basalt-hosted xenoliths. Magmatic textural features and chemical compositions of the glass are compatible with a primary nature of the veins. Laser-ablation ICP-MS analyses on carbonate and glass indicate disequilibrium between the carbonate and silicate phases and suggests different origins. Trace element ratios (e.g. Ce/Pb, Nd/Pb, etc.) and stable and radiogenic isotope compositions strongly suggest an origin for a carbonate-silicate melt from subducted lithosphere. We suggest that fluid-rich melts may have infiltrated the upper mantle rocks in two stages: 1) a fluid or fluid-rich melt infiltrated and interacted with the mantle peridotite producing amphibole with $\delta^{18}O$ values similar to that typical for mantle; 2) subsequently, a carbonate-bearing melt or fluid derived from subducted crust infiltrated the metasomatised peridotite reacting with the amphibole and causing carbonate crystallization. The study was financially supported by the Hungarian Scientific Research Fund (to A.D., OTKA T 029078). The ICP-MS work was carried out in an EC funded Large Scale Analytical Facility (SOCFAC, contract no. HPRI-CT-1999-00108).