Geophysical Research Abstracts, Vol. 8, 04709, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04709

The composition of low degree melts of fertile peridotites at 1 and 1.3 GPa

D. Laporte, P. Schiano and P. Boivin

Laboratoire Magmas et Volcans, CNRS, Université Blaise Pascal, IRD, OPGC, Clermont-Ferrand, France (laporte@opgc.univ-bpclermont.fr)

Piston-cylinder experiments were performed to characterize the composition of liquids formed at very low degrees of melting (a few wt. % to $<$ 1 wt. %) of fertile peridotites. A fertile mantle composition (with 400 ppm K_2O) and an "enriched" mantle composition (with 900 ppm K_2O) were prepared by adding small amounts of synthetic basalt to a spinel lherzolite xenolith from Mont Briançon volcano, French Massif Central. Three series of experiments were carried out: two series with the fertile mantle composition at 1 and 1.3 GPa, and T ranging from 1180˚C to 1290˚C; and a third series with the enriched mantle composition at 1.3 GPa and T in the range 1130-1250˚C. We used the "microdyke" technique recently developed in our laboratory to extract the liquid phase from the partially molten peridotite, allowing to analyse liquid compositions even at degrees of melting $<$ 1 wt. % (Laporte et al., 2004, *Contrib. Mineral. Petrol.*, 146: 463-484). Liquid was in equilibrium with olivine + orthopyroxene + clinopyroxene + spinel in all the experiments except at 1 GPa and $T \leq 1190$ ˚C where it was in equilibrium with olivine + orthopyroxene + clinopyroxene + spinel + plagioclase.

In all three series, important variations of liquid compositions were observed with decreasing temperature, including strong increases in SiO_2, Na_2O, K_2O, and Al_2O_3 concentrations, and decreases in MgO, FeO, and CaO concentrations. In the IUGS chemical classification, the experimental liquids range from subalkaline basalts at high temperature to phonolites at low temperature. The most extreme liquid composition has $\approx$ 57 wt. % SiO_2, 21 wt. % Al_2O_3, Na_2O + K_2O $\approx$ 13 wt. %, and MgO, FeO, and CaO concentrations as low as 2-3 wt. %, but still it coexists with typical mantle olivine and pyroxenes with Mg/(Mg+Fe) ratios equal to 0.89. A series of reversal experiments is in progress to evaluate how close to chemical equilibrium are the liquid compositions in our near-solidus runs.

These experiments demonstrate that incipient partial melting of fertile mantle rock-types at moderate pressures can produce liquid compositions very different from standard basalts, such as mugearites, benmoreites, and phonolites. They also suggest that the nepheline-normative, SiO_2- and alkali-rich glass inclusions hosted in olivine grains from peridotite xenoliths (Schiano et al., 1998, *Earth Planet. Sci. Lett.*, 160: 537-550) can be generated by direct partial melting of lherzolites at degrees of melting $\leq$ 1 wt. %.