



Mantle Xenoliths from Central and Southern Vietnam

Christoph Hauzenberger (1), Jürgen Konzett (2), and Hoang Nguyen (3)

(1) NAWI Graz Geocentre - Petrology and Geochemistry, University of Graz, Austria (christoph.hauzenberger@uni-graz.at),
(2) Institute of Mineralogy and Petrography, University of Innsbruck, Austria, (3) Institute of Geological Sciences, Vietnam Academy of Science & Technology, Vietnam

The basalt plateaus in central and southern Vietnam cover a large area of approximately 23000 km² and comprise tholeiitic and alkali basalts of Neogene to Quaternary age (Hoang & Flower, 1998). The alkali basalts contain frequently clinopyroxene, zircon and sapphire xenocrysts as well as a variety of different xenoliths. The mantle fragments, a few cm to tens of cm in size, consist of spinel lherzolites as well as subordinate amounts of spinel harzburgites and pyroxenites. Samples from Pleiku, Da Lat, Nui Trai, Xuan Loc and the off shore locality Ile de Cendres were recovered and investigated. Most samples display the simple lherzolitic mineral assemblage Ol–Opx–Cpx–Sp. The Ol, Cpx and Opx crystals are equigranular while Sp is found usually as smaller sized intersertal phase or as partly oriented inclusions in Cpx. Clinopyroxene occurs in two generations, where Cpx II recrystallized as “spongy rim” around Cpx I. Cpx I has a very uniform composition between different samples with a typical XMg (=Mg/(Mg+Fe²⁺)) of 0.92 to 0.98, a XNa (=Na/(Na+Ca)) of 0.10 to 0.16, a Cr₂O₃ content of 0.6–0.9 wt. % and Al₂O₃ values of c. 6 to 8 wt.%. Cpx II has a lower XNa and Al₂O₃ content as well as higher XMg and Cr₂O₃ content compared to Cpx I. Orthopyroxene typically has a XMg of c. 0.90 to 0.93. The XMg values for Ol differ slightly between different samples but are within 0.84 to 0.94. Spinel grains have a variable composition with XMg from 0.65 to 0.92 and XCr (Cr/(Cr+Al+Fe³⁺)) of 0.08 to 0.25. The use of the Cpx–Opx thermometer (BREY & KOEHLER, 1990) and the Al and Cr in Ol thermometer (DE HOOG et al., 2010) allowed to constrain the temperature with 800 to 1100 °C. Pressures are in the range of 1.5 to 2.0 GPa based on calculated temperatures and an average geothermal gradient for this region.

Trace and rare earth element composition of Cpx I was determined by LA-ICPMS. While most Cpx compositions are slightly depleted in light rare earth elements (LREE), typical for average depleted mantle compositions, some samples are strongly enriched in LREE indicating mantle metasomatic processes. The sample displaying the highest level of LREE enrichment in Cpx has the lowest calculated temperature (T = c. 800°C) and one of the highest Ni content in olivine (3000 ppm). The variation in LREE as well as LIL element concentration in Cpx from different xenoliths is evidence for the heterogeneous nature of the mantle beneath Indochina. In addition elongated apatites are found in this sample indicating metasomatic influence from a possible carbonatitic melts

Financial support from the Austrian Academy of Sciences and ASEA-Uninet is gratefully acknowledged. This is a contribution to IGCP557.

BREY, G.P., KOEHLER, T.P. (1990): *J. Petrology*, 31:1353–1378.

DE HOOG, J.C.M., GALL, L., CORNELL, D.H. (2010): *Chem. Geol.*, 270, 196–215.

HOANG, N. & FLOWER, M. (1998): *J. Petrology*, 39, 369–395.