CARBONATITE METASOMATISM IN THE UPPER MANTLE BENEATH THE BAKONY-BALATON HIGHLAND AND LITTLE HUNGARIAN PLAIN VOLCANIC FIELDS, WESTERN HUNGARY: EVIDENCE FROM UPPER MANTLE XENOLITHS

Enikõ Bali*, György Falus*, Csaba Szabó*, Orlando Vaselli** and **Kálmán Török*****

** Lithosphere Research Group, Department of Petrology and Geochemistry, Eötvös University, Budapest, Múzeum krt. 4/A, H-1088, Hungary.*

*** Department of Earth Sciences, University of Florence, via G. La Pira, 4, 50121 Florence, Italy.*

**** Department of Geophysics, Eötvös University, Budapest, Ludovika tér 2, H-1083, Hungary.*

ABSTRACT

Lithospheric upper mantle xenoliths hosted in Neogene alkaline basalts from the Bakony-Balaton Highland and Little Hungarian Plain Volcanic Fields of the Carpathian-Pannonian region have been studied extensively petrologically, geochemically and isotopically (e.g., Embey-Isztin et al., 1989; Downes et al., 1992; Szabó et al., 1995). Based on these studies, remarkable incompatible trace element enrichment and variable ε_{Nd} and ε_{Sr} values of the deformed Type I. xenoliths have been recognized and interpreted by Downes et al. (1992) as being due to the host alkaline magmas and subduction-related calc-alkaline magmas or fluids. However, apparent evidence for mantle metasomatism such as presence of amphiboles and phlogopites, melt pockets, veins and fluid and/or silicate melt inclusions occurring in these xenoliths have been reported very rarely (Embey-Isztin, 1976;. Embey-Isztin et al., 1989; Szabó et al., 1995).

Here we present the results of detailed petrographic and major element analyses of melt pockets and veins found in six selected upper mantle samples (four peridotites and two pyroxenites) collected at the best known xenolith locations (Szentbékkálla and Gérce) of the studied volcanic fields. The goal of this work is to characterize the mantle melts and/or fluids formed and migrated in the mantle.

According to the petrography, the melt pockets (up to 4.5 mm in diameter) occur as partially crystallized multicomponent aggregates replacing partially or totally melted Cr-diopsidic clinopyroxenes or rarely pargasitic amphiboles. The melt pockets are composed of silicate glass, newly formed clinopyroxene, olivine, spinel, carbonates, ± vesicles ± sulfide blebs. The melt veins (up to 1.5 mm in thickness) occur frequently as parallel cracks crosscutting the whole xenolith. They consist mostly of silicate glass and carbonates. Newly formed clinopyroxenes, olivines and spinels are very rare.

Based on electron microprobe analyses, the composition of carbonates is calcite and Mg-calcite with small amounts of FeO (up to 0.54 wt%) and MnO (up to 1.5 wt%). Compositions of silicate glasses show relatively wide silica range (50 to 59 wt%), high alumina (18 to 25 wt%) and high total

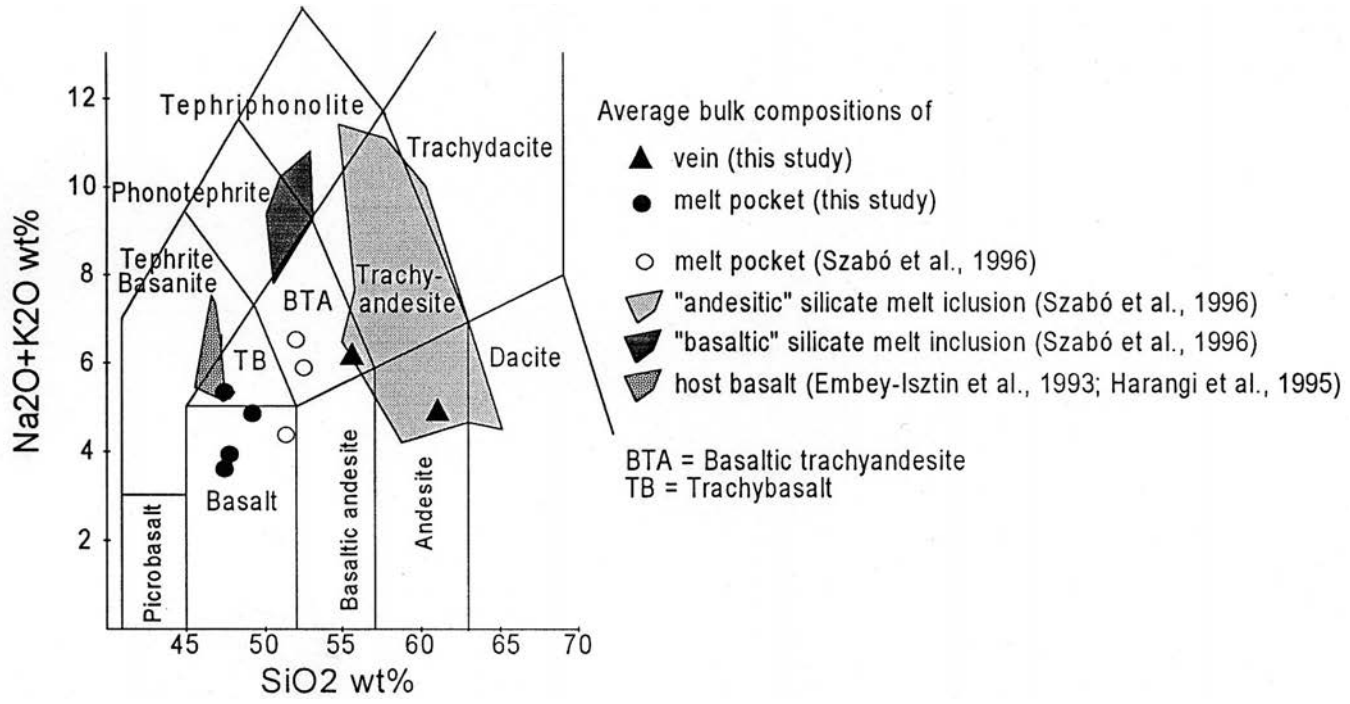

Fig. 1 - TAS diagram for average bulk compositions of melt pockets and veins in the Bakony - Balaton Highland and Little Hungarian Plain upper mantle xenoliths compared to those of melt pockets and two types of silicate melt inclusions in the Nógrád-Gömör upper mantle xenoliths (Szabó et al., 1996). Also shown field of composition of host basaltic lavas reported by Embey-Isztin et al. (1993) and Harangi et al. (1995).

alkalis (5.5 to 7.8 wt%), relatively low MgO (1.8 to 4.5 wt%) and FeO (2.4 to 6.8 wt%) content.

To estimate the bulk compositions of the melt pockets and veins, we have performed mass balance calculation, based on the modes and chemistry of the melt pockets and veins. The bulk compositions of the melt pockets are basaltic and trachybasaltic somehow resembling the composition of the host basalt reported by Embey-Isztin et al. (1993) and Harangi et al. (1995). The bulk compositions of the veins fall in fields of andesite and basaltic trachyandesite close to the large area of "andesitic" silicate melt inclusions occurring in Nógrád-Gömör xenoliths studied by Szabó et al. (1996).

REFERENCES

Downes H., Embey-Isztin A. and Thirwall M.F., 1992. Petrology and geochemistry of spinel peridotite xenoliths from Hungary: evidence for an association between enrichment and deformation in the mantle. Contrib. Mineral. Petrol., 109: 340-354.

Embey-Isztin A., 1976. Amphibolite-lherzolite xenoliths from Szigliget, North of the Lake Balaton, Hungary. Earth Planet. Sci. Lett., 31: 297-304.

Embey-Isztin A., Dobosi G., James D.E., Downes H., Poultidis C. and Scharbert H.G., 1993. A compilation of new major, trace element and isotope geochemical analyses of the young alkali basalts from the Pannonian Basin. Fragmenta Mineral. Palaeontol., 16: 5-26.

Embey-Isztin A., Scharbert H.G., Dietrich H. and Poultidis H., 1989. Petrology and geochemistry of peridotite xenoliths in alkali basalts from the Transdanubian Volcanic Region, West Hungary. J. Petrol., 30: 79-105.

Harangi Sz., Vaselli O., Toranini S., Szabó Cs., Harangi R. and Coradossi N., 1995. Petrogenesis of Neogene extension-related alkaline volcanic rocks of the Little Hungarian Plain Volcanic Field (Western Hungary), In: H. Downes and O. Vaselli (Eds.), Neogene and Related Magmatism in the Carpatho-Pannonian Region. Acta Volcanol., 7: 173-188.

Szabó Cs., Vaselli O., Vannucci R., Bottazzi P., Ottolini L., Coradossi N. and Kubovics I., 1995. Ultramafic xenoliths from the Little Hungarian Plain: a petrologic and geochemical study, In: H. Downes and O. Vaselli (Eds.), Neogene and Related Magmatism in the Carpatho-Pannonian Region, Acta Volcanol., 7: 249-263.

Szabó Cs., Bodnar R.J. and Sobolev A.V., 1996. Metasomatism associated with subduction-related, volatile-rich silicate melt in the upper mantle beneath the Nógrád-Gömör Volcanic Field, Northern Hungary / Southern Slovakia: Evidence from silicate melt inclusions. Eur. J. Mineral., 8: 881-899.