Geophysical Research Abstracts
Vol. 17, EGU2015-10180-1, 2015
EGU General Assembly 2015

Multi stage peridotite-melt reaction evidenced by xenolith suite from Wilcza Góra basanite (SW Poland)

Magdalena Matusiak-Małek (1), Jacek Puziewicz (1), Theodoros Ntaflos (2), Michel Grégoire (3), and Piotr Wojtulek (1)

(1) University of Wroclaw, Institute of Geological Sciences, Wroclaw, Poland (magdalena.matusiak@ing.uni.wroc.pl), (2) University of Vienna, Department of Lithospheric Research, Althanstrasse 14, Vienna, Austria, (3) Géosciences Environnement Toulouse, CNRS-IRD-Toulouse University, Midi-Pyrénées Observatory, 14 av. E. Belin, Toulouse, France

Presence of hydrous phases in Earth's lithospheric mantle is a typical manifestation of modal metasomatism. Mantle xenoliths occurring in Northern margin of the Bohemian Massif usually contain no hydrous phases (Puziewicz et al., 2015). The latter, if present, form small and scarce crystals of pargasitic amphibole (e.g. Nowak et al., 2010, EGU abstracts; Matusiak-Małek et al., 2010, Lithos). The exception are xenoliths from Wilcza Góra basanite (SW Poland). The xenoliths have composition of harzburgite, scarce dunitic and wehrlitic ones occur as well. Pyroxenites of cumulative textures occur also in the Wilcza Góra.Pargasitic amphibole occurs in all the types of the xenoliths. Amphibole forms: 1) large (up to 1 cm) subhedral crystals, 2) exsolution lamellae in pyroxenes, and 3) cores of secondary clinopyroxenes in integranular aggregates. Composition of amphibole varies in wide ranges between xenoliths (e.g. mg# 0.73-0.95). The mineral is in equilibrium with coexisting clinopyroxene (mg#=0.79-0.93) in terms of major and trace elements.
Variations in Mg and Fe contents in olivine and orthopyroxene are significant and continuous (Fo=77-92 and mg#=0.85-0.92, respectively). Enrichment of peridotites in Fe may result from: (1) cumulative origin, or (2) metasomatic enrichment due to reaction with mafic silicate melt. But, as was discussed in Matusiak-Małek et al. (2014), features like: lack of cumulative textures, high NiO in olivine (0.25-0.43 wt.%) promotes the second possibility. As clinopyroxene and spinel record no melting (e.g. lack of Al-Na positive and cr#-mg# negative correlations, respectively), they cannot be a primary phase and must have been introduced into peridotite by metasomatic reactions ("stealth" metasomatism; O'Reillly and Griffin, 2013, Springer). Trace element composition of clinopyroxene and amphibole and their equilibrium suggest their crystallization from the fractionating mafic silicate melt, possibly the same which caused enrichment of peridotite-phases in Fe. The melt must have been 1) hydrous (crystallization of amphibole) and 2) relatively "cold" (crystallization of clinopyroxene; Baltitude and Green, 1971, JoP). Composition of the final product of the melt fractionation was very similar to the host Wilcza Góra basanite. Modelled composition of Wilcza Góra amphibole and clinopyroxene in equilibrium with alkaline silicate melt suggests that the two minerals occurring in part of the peridotites and in cumulative xenoliths are precipitates from host basanite.

This study was possible thanks to an award from Polish National Centre for Science, grant no. UMO-2011/03/B/ST10/06248.