European Mineralogical Conference
Vol. 1, EMC2012-157, 2012
European Mineralogical Conference 2012

The mantle origin of clinopyroxene phenocryst cores in the Księginki (SW Poland) nephelinite

M. Goleń (1), J. Puziewicz (1), T. Ntaflos (2), and D. Lipa (1)
(1) University of Wroclaw, Poland, (2) University of Vienna, Austria

Cenozoic occurence of the Księginki nephelinite in Lower Silesia in SW Poland belongs to the Central European Volcanic Province . This occurrence comprises three lava flows, each of Miocene age, which are separated by horizons of the volcanic conglomerates [1].We studied nephelinite from the deepest part of the Księginki quarry, which probably represents the volcanic vent. The nephelinite consists of phenocrysts of olivine and clinopyroxene embedded in the aphanitic groundmass, consisting of subsilisic titanian diopside, nepheline, and, subordinately, magnetite-ulvospinel and post-magmatic analcime and feldspar [2]. Groundmass grains does not exceed few tens μm in size.

Phenocrysts of clinopyroxene commonly are few mm in size. Four types can be defined basing on their chemical composition and internal structure: type I- has homogeneous core (mg# $\sim$90 or slightly more), spongy and/or patchy mantle and homogeneous outer rim, type II- is characterized by spongy and often also patchy core, which size differs significantly from grain to grain (few hundreds μm to few mm), and which usually contacts directly with the outer rim, type III- crystals rarely exceeds few hundreds μm (typically $<$ 200 μm), patchy core is surrounded by well-developed zoned rim, type IV- homogeneous core (mg# $\sim$82), surrounded by mantle and outer rim.

The cores of the type I phenocrysts are diopsides (sensu Morimoto, [3]), which representative composition is $(Na_{0,05}Ca_{0,88}Mg_{0,07})(Mg_{0,83}Fe^{2+}_{0,41}Fe^{3+}_{0,05}Al_{0,07})\ Al_{0,08}Si_{1,92}O_6$. The composition of outer rims of phenocrysts is identical to the groundmass clinopyroxene (typically $(Na_{0,03}Ca_{0,95}Mg_{0,02})(Mg_{0,64}Fe^{2+}_{0,07}Fe^{3+}_{0,14}Al_{0,04}Ti_{0,10})Al_{0,35}Si_{1,65}O_6$, with up to 0.02 atoms of Ni pfu. The zonation in mantles and outer rims is due to increase in Fe, Al and Ti contents and decrease in Si, Mg and Ca contents outwards.

Part of the homogeneous and patchy/spongy cores of phenocrysts is chemically similar to the clinopyroxenes occurring in olivine clinopyroxenite cumulates or to the cores of megacrysts from the Księginki nephelinite, which originated in mantle at depth 35 -50 km [2]. Therefore, by analogy, we assume their mantle provenance. Part of these cores have been subjected to decompression melting during lava eruption as is suggested by their spongy texture. The zoned mantle surrounding the type I and III phenocrysts originated probably en route to the surface. The phenocrysts of type II do not record the extended growth during lava migration, thus we suggest that they come from xenoliths of cumulates, fragmented at late stages of eruptive process. The crystals of type IV, containing low-magnesian core, crystallized probably entirely en route to the surface.

[1] KozŁ owski, S. & Parachoniak, W. (1960) The products of basalts weathering in the region of Lubań in Lower Silesia. *Acta Geologia Polonica* 10(2), 285-318 (in Polish, French abstr.).

[2] Puziewicz J., Koepke J., Grégoire M., Ntaflos T., Matusiak-MaŁ ek M. (2011) Cenozoic rifting in Central Europe: Evidence from the Księginki nephelinite (SW Poland) xenolith suite. *Journal of Petrology* 52, 2107-2145.

[3] Morimoto, N. (1988) Nomenclature of pyroxenes. *Mineralogical Magazine* 52, 535-550.