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Cenozoic pre-volcanic metasomatism in lithospheric mantle beneath SW Poland

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Cenozoic alkaline volcanism in Central and Western Europe was connected with extensive lithospheric mantle modification by migrating melts and fluids. The Eger Rift in Bohemian Massif is the easternmost rift structure formed at the time of the volcanism. Mantle xenoliths brought to the surface by Cenozoic lavas show that the alteration of lithopsheric mantle beneath the Eger Rift was typically cryptic and anhydrous.

One of the best examples of pre- to synvolcanic metasomatism in the area of Eger Rift is offered by xenolith suite from the Miocene Księginki nephelinite, occurring at the NE termination of the Rift (SW Poland). Peridotite and pyroxenite xenoliths show that at depth of 35 – 50 km the lithospheric mantle was infiltrated by alkaline silica-undersaturated magma resembling the Księginki nephelinite. Olivine clinopyroxenites originated by crystal accumulation in places of channelized magma flow. The "Fe-metasomatism" operated in mantle harzburgites subjected to pervasive magma flow. It lowered olivine Fo (down to 86%) and resulted in REE patterns of clinopyroxene identical to those ocurring in olivine clinopyroxenites. The mg# of clinopyroxene is also lowered to similar values (Puziewicz et al. 2011). The clinopyroxene megacrysts occurring in the Księginki nephelinite are the remnants of very coarse-grained clinopyroxene cumulates, uncompletely solidified and disaggregated during eruption. The fine-grained glass-bearing aggregates of olivine + clinopyroxene $\pm$ plagioclase or titanian phlogopite occur in the xenoliths. They offer the snap-shot picture of the various stages of metasomatism and show that part of the xenoliths resided shortly in pressures enabling plagioclase crystallization. Alternatively, plagioclase crystallization in melt pockets could take place "en route" to the surface at low pressures. All the lithospheric mantle section sampled by the Księginki nephelinite was thermally rejuvenated during volcanism and shows temperatures of 1060 - 1120 ºC.

REFERENCES:

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