# GRANULITES OF THE BOHEMIAN MASSIF: A BAG WITH TWO STORIES

P. JAKEŠ , E. JELÍNEK

*Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University, Albertov 6, 128 43 Prague 2, Czech Republic*

The Bohemian Massif (BM), the easternmost part of Variscan chain in Europe, contains both autochthonous and allochthonous terrains. Thin skinned units (nappes) characterize parts of Moldanubian, and Saxothuringian and cover the deep structure of BM. The occurrences of granulites in Moldanubian (Gföhl unit) and the crustal (granulite) xenoliths in alkaline basalts of North Bohemian Cenozoic province indicate the presence of two principally different lower crust sections in and under the nappes.

The southern part of the Bohemian Massif (exposed at the surface) is characterized by the presence of high-P high-T "ga–ky granulites" (accompanied by garnet peridotites) whereas the northern part, containing pyroxene granulites (charnockites) with high-T, low-P paths, is accompanied by upper mantle four-phase lherzolites. Both granulites are compositionally close to granites in respect to Ab–Or–Oz relations and differ in respect to trace element compositions. Garnet–kyanite granulites have trace-element abundances with granite features: high LILE contents, LREE-enriched patterns, negative Eu anomaly (Fig. 1), but low Th and U and varied Zr abundances. The contents of siderophile and transitional elements are slightly higher than corresponding contents in granites. Positive correlation of Zr with Th and U, and negative correlation of Zr with LILE elements, e.g., Rb suggests that melting or removal of zircon played a major role in generating the granulite trace element signature. North Bohemian charnockites that are LILE poor with Eu positive anomalies resemble "shield granulites" (Fig. 2).

Southern Bohemian granulite bodies contain blocks and xenoliths of ultramafic rocks not related to metamorphic structures of granulites. Xenoliths occur in both ga–ky (not retrogressed) and ga–bi (retrogressed) rocks. Ultramafic rocks were incorporated into granulites in the solid state and their mineral equilibria indicate origin in the lithospheric as well as asthenospheric mantle and consequent fast exhumation. The interval of time of protolith crystallization of granulites (i.e., 370–340 Ma) is narrow and indicates a "granulite event" in the early Variscan. The event is contemporaneous with the emplacement of "igneous rocks" that share granulite facies features (e.g., opx–cpx parageneses), have strong geochemical mantle signatures and are part of major batholiths (durbachite types) in Moldanubian terrane (Tábor, Jihlava, Weinsberg, Rastenberg). Differences in metamorphic grade of granulites and surrounding gneisses, composition, and presence of ultramafic xenoliths suggest that ga–ky granulites are pristine dehydration melts that may have formed at collisional environment at the expense of crustal material of lower plate. These melts have crystallized with ga and ky as a near liquidus phases or as a product of dehydration incongruent melting. On the rise from the lower plate the melts captured ultramafic rocks and reaction of ga $\rightarrow$ opx + plg has taken place. The intrusions of ga–ky granulites stopped in the middle crust (amphibolite facies). Structure of granulite bodies and metamorphic rock textures relate to the retrogressive changes, postdate ga–ky and px-bearing parageneses and represent post-emplacement features.

The granulites (charnockites) of North Bohemia are distinctly different and may represent fragments of Baltica or may be remnants of such microcontinents as Armorica, Perunica, or Avalonia.

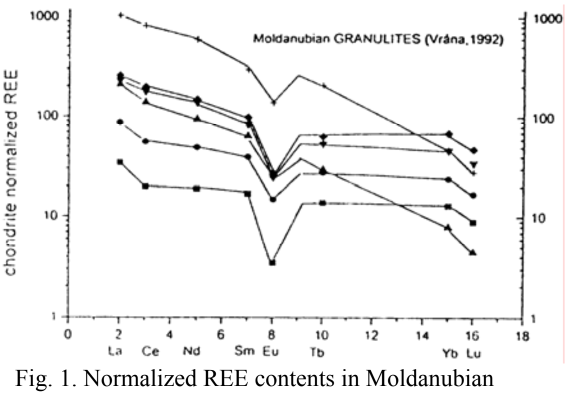


Fig. 1. Normalized REE contents in Moldanubian garnet–kyanite and perpotassic granulites (Vrána, 1992).

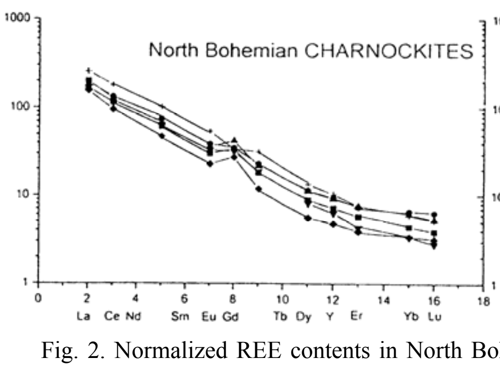


Fig. 2. Normalized REE contents in North Bohemian charnockites (new data).