Granulite Xenoliths from the Doupov Volcanic Complex Area – Petrology and Geochemistry

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Crystalline basement in the Ohře Crystalline Complex, situated at the SE margin of the Saxothuringicum, is to a large extent covered by the Tertiary volcanics of the Doupov Volcanic Complex. Xenoliths of the high-grade rocks (granulites, orthogneisses) found in agglomerated welded tuffs S of Kadaň provide a valuable information on the basement character. Tuffs of the Oligocene-Miocene age and a thickness of 80-140 m represent the base of the Doupov volcanic formation. The xenoliths reach up to >> 1m in size and their occurrences are bound to the proximity of a probable fissural volcanic centres (Hawaiian type of explosion).

The rock assemblage involves light, Bt-poor, massive granulites, and banded Bt-bearing granulites. The two textural types contain similar mineral assemblages of Grt-Ky-Afs-Pl±Bt, with accessory rutile, apatite and zircon. They differ in the abundance and distribution of Grt and Ky, which are more abundant and in oriented trails and clusters (±t) in the banded types. A unique coarse-grained garnet and kyanite-rich (+Qtz+Afs) granulite represents a specific more peraluminous rock type - the high Grt contents ranks it to kinzigites.

The microtextures of granulite samples from xenoliths further constrain the rock evolution derived previously from the exposed rocks (Kotková 1993). Large Grt and Ky grains in contact and mesoperthite enclosing Ky represent the original HP-HT assemblage. Kyanite is generally oriented. Stretched and bent kyanite grains and folded Grt-rich layers reflect the polyphase deformation of the rocks, the effects of which were completely obliterated in the annealed rock matrix. Small garnet crystallizing at the rims of the large garnet and kyanite provide evidence for two garnet generations present in the rocks.

Analysed garnets contain from 18 (light banded granulite type) up to 33 mol % of Prp (Grt-Ky-rich granulite). They show broad homogeneous cores in terms of major components, and generally Alm increase and Prp and Grs decrease at the rim. These features, commonly observed in granulites, reflect diffusional homogenization at high temperatures (cores), and subsequent cooling and decompression (rims). Garnets from the Grt-Ky rich granulite types, however, display a different zoning - Grs increase and Prp, Alm and X_{Mg} decrease at the grain rim. This apparently contradictory feature is interpreted rather as a result of two superposed processes, as in some grains the Grs increase is preceded by its decrease.

Chemical composition of granulites in the area corresponds to granites (light felsic granulites, both massive and banded), granodiorites or quartz diorites (subacid granulites, richer in Grt, just exposures) and diorites (Grt-Ky rich "kinzigites"). Major element variations with increasing SiO_2 indicate a co-genetic character of all the granulite types, with features characteristic of magmatic series. Trends of many of the major and trace elements, including REE, are compatible with processes of magmatic differentiation by fractionation of mafic minerals and feldspar.

Sub-parallel lithological banding on the scale of centimeters to meters, with prevalence of felsic massive types, is characteristic both for granulites in the exposures and those in the xenoliths. There is no equivalent for the "kinzigite" of interme-

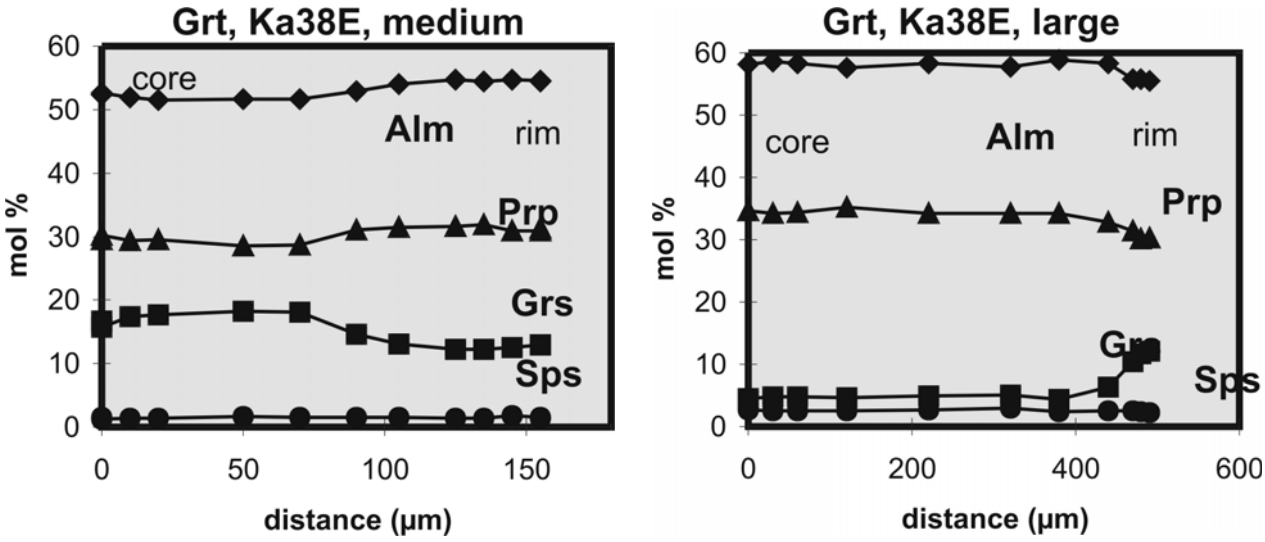

Fig.1. Garnet zoning, Grt-Ky rich granulite.

diate chemical composition known from the exposures. Comparative study of rock textures, mineral assemblages, and bulk rock and mineral chemistry, was carried out. Taking into account also prevailing foliation trends and rock types distribution in the exposures in all the Ohře Crystalline area, it suggests that the rocks sampled by the Tertiary volcanics represent rather a continuation of the granulite bodies from the east. Absence of the granulite types present in the west may reflect either a discontinuity of the granulite belt in the basement, or heterogeneity of the granulite body.

References

KOTKOVÁ J. 1993. Tectonometamorphic history of lower crust in the Bohemian Massif - example of north Bohemian granulites. *Spec. Pap. Czech Geol. Survey*, 2, 42 pp.