

## Garnet-Bearing Mafic Granulites from the Lišov Granulite Massif

Jana KOTKOVÁ

Czech Geological Survey, Klárov 3, Praha 1, Czech Republic

Intermediate and basic granulites, although subordinate in the south Bohemian granulite bodies, represent important rock types for reconstruction of P-T evolution of these bodies. In the Lišov granulite massif, borehole LV1 situated south of Lišov provides a unique fresh material of this kind. The rocks display cm to dm-scale compositional banding, with predominance of granulites of dioritic to gabbroid composition. Relatively abundant are garnet-bearing mafic granulites, in which garnet (up to 5mm in size) has been partially preserved. Garnets feature homogeneous cores containing up to 34 vol. % Prp and 20 vol. % Grs, and  $X_{Ca} + X_{Mg}$  decrease along with  $X_{Fe} + X_{Mn}$  increase in about 200 m wide rim zone. This kind of zoning and widespread reaction textures are consistent with operation of decompression reactions  $Grt + Cpx + Qtz = Opx + Pl$  and  $Grt + Cpx = Opx + Pl + Spi$ . These reactions pro-

duce  $Opx + Pl \pm Spi$  symplectites around garnet or even results in its complete consumption.

Adjacent to domains with relic garnet, orthopyroxene-plagioclase clinopyroxene pargasitic hornblende mineral assemblage with equilibrium polygonal mosaic texture occurs. Opx and Cpx grains in the two-pyroxene granulites are homogeneous, and Opx composition is similar to that of the symplectite Opx. Observed decompressional textures along with presence of Al-Na-enriched clinopyroxene inclusions in garnet are consistent with a high-pressure stage of the granulite evolution, pre-dating formation of the medium-pressure two-pyroxene granulites in the Lišov massif. Preliminary results of Grt-Cpx and Grt-Cpx-Pl-Q geothermobarometry indicate minimum P-T conditions of 910°C and 13 kb for this high-pressure stage.

## Contribution to the Problem of Alpine Tectono-Metamorphic Overprint in the Southern Veporicum Basement (Inner Western Carpathians)

Martin KOVÁČIK<sup>1</sup>, Jano KRÁL<sup>1</sup> and Henri MALUSKI<sup>2</sup>

<sup>1</sup> Geological Survey of Slovak Republic, Mlynská dolina 1, 817 04 Bratislava, Slovak Republic

<sup>2</sup> URA CNRS 1371, Univ. des Sciences et Techniques, Place E. Bataillon, F-34095 Montpellier, France

The southern Veporicum underwent the strongest Alpine tectono-metamorphism of the three basic Inner Western Carpathian units (Tatricum, Veporicum and Gemericum). Inasmuch as no indicative metamorphic mineral assemblages have been found in the clastic beds of the Veporicum Mesozoic cover, we concentrated on the variety of mineral reactions, reflected in the polymetamorphosed basement rocks.

Metamorphic overprinting is illustrated by common replacements of the pre-Alpine metamorphic assemblages consisting of porphyroblasts of, e. g., micas, plagioclase, garnet, staurolite. The newly formed metamorphic assemblages (in metapelites: phyllosilicates, tiny garnet of grossularite-almandine composition, chloritoid and scarcely kyanite, staurolite and amphibole of tschermakitic composition) are of the Barrovian type and are supposed to be associated with an increased geothermal gradient. The Alpine reworking of the basement is largely controlled by open-system reactions which show a late-syn- to post-kinematic character. The principal sources of Alpine regional metamorphism stem from a deep reactivation of the basement during which the fluid and thermal circulation increased. The use of phengitic muscovite and/or in grossularite component enriched garnet for geothermobarometric purposes is discussed and there are outlined some pitfalls in a uniform interpretation in case of polymetamorphosed or weakly metamorphosed rocks. The composition of phengitic muscovites show a strong dependence on bulk rock geochemistry

(especially on the  $Al_2O_3$  content) and the negative correlation between the Na (respectively  $Al_{int}$ ) and K (and/or Si along with an increase of FM) per s.f. is documented, too. The Alpine alterations are at a more local scale characterised also by the transformation of a granitic rock to kyanite - Mg-chlorite schist in the process of Mg-metasomatism which is envisaged synchronous with formation of talc on expense of magnesite. These fluid-assisted metamorphic reactions are closely linked with the mobility of  $Al_2O_3$ . Conditions of the Alpine regional metamorphism are estimated with caution at temperatures between 350°C and 500°C and under lower to middle pressure (2.5-4.5 kb).

Four <sup>40</sup>Ar/<sup>39</sup>Ar spectra of the newly formed amphiboles from the metapelites, which fall within a range of 105-115 Ma, presumably reflect the onset of the Alpine regional metamorphism (weak synkinematic recrystallisation). This may reflect collision of the Veporicum with the Gemericum marked by linear deformation fabrics which could be related to "extension parallel with the orogen". The relative second metamorphic event is the studied Barrovian late-syn- to postkinematic recrystallisation, which might have taken place due to post-thickening relaxation. Many data (predominately muscovites) cluster within a narrow time span of ca. 86-88 (85-89) Ma. This indicates an accelerating uplift and probably fast unroofing which was to a certain degree associated with propagation of recrystallisation. Unroofing was probably followed by thrus-

