Are North Bohemian felsic granulites products of HT–HP melting?

J. Kotková *Czech Geological Survey, Klárov 3, Praha 1, Czech Republic,*

Introduction

Garnet- and kyanite-bearing, corundum-normative felsic rocks (leucogranites) occur within granulite bodies of the Bohemian Massif. Large volumes of these rocks were found in the Ohe (Eger) crystalline in the north Bohemia, close to the Saxothuringicum/Bohemicum boundary.

Petrology and mineralogy

The rocks are massive, with a coarse-grained matrix, showing signs of a certain annealing (finer-grained recrystallization), with heterogeneous distribution of minerals, however, devoid of effects of a strong ductile deformation. Their mineral assemblage is Qtz-mesoperthite-Pl-Grt-Ky (Pl$\leqslant$10 vol.%, about equal Qtz and mesoperthite proportions, Ky about 1, Grt up to 3 vol.%). Normative contents of Ab-Or-Qtz correspond to the wet granite minimum. Rutile, apatite and zircon are accessory. Up to 3 mm large garnets are poikilitic, containing inclusions of Qtz, Pl, mesoperthite and Rt. Elongated kyanite grains reach up to 3mm. Alkali feldspars are perthitic, with recalculated composition of $Ab_{53}An_5Or_{42}$, Pl has An_{8-13}. Garnets ($Alm_{77-79}Prp_{13-15}Grs_{4-5}Sps_{0-2.5}$) have rather flat zoning profiles, showing a slight Grs decrease at the rim.

P–T conditions and *P–T* path

The rocks equilibrated under minimum conditions of 800°C (two-feldspar thermometry) and 13.4kb (GASP, Grt rim). Higher Grs contents in garnet cores and analogy with associated meta-pelitic granulites suggest close-to-peak pressures of at least 15kb.

Destabilization of kyanite into Ms+Qtz (no Sil) and garnet into MsBt+Qtz (no Crd), and presence of Rt (Ilm absent) are consistent with nearly-isothermal decompression and subsequent cooling and decompression outside the sillimanite stability field.

Interpretation

Because of a high Fe/Mg ratio and low Ca contents in felsic granulites, the phase relationships are approximated by grids constructed for the system KFASH. Calculated P-T values fall above the dry solidus for muscovite granite (Huang and Wyllie, 1981) which lies within the interval of muscovite dehydration melting. *P–T* data and the 'pseudo-granitic' composition of the rocks suggest their interpretation as products of melting and crystallization at high pressures. The idea of partial melting and crystallization under lower crustal conditions has been discussed for development of hypersolvus leucogranites from the south Bohemia (Vrána and Jake 1982).

Special rock type and its formation

Layers of Grt and/or Ky-bearing felsic mobilizates concordant or discordant to the adjacent rocks (garnet-biotite paragneisses, garnet-bearing orthogneisses) occur in small amounts in the area. Their mineral assemblage is Qtz-Afs-Pl-Grt-Ky (45-35-10-5-2 vol%), retrograde Ms (2%) and Bt (traces). They contain large poikilitic garnets, containing quartz and feldspar inclusions. Alkali feldspars are perthitic, Pl contains 11–15 mol%An. Garnet ($Alm_{66-68}Prp_{22-23}Grs_{8-10}Sps_{0-1.5}$) has rather flat zoning profile, in some cases with a slight Grs decrease (by 2mol%) and Prp increase (by 2mol%) in about 100 μm thick garnet rim zone. The rocks equilibrated under minimum conditions of 766°C (two-feldspar thermometry) and 14.8 (13.4) kb (GASP, Grt rim).

P–T data, rock texture, mineral assemblage and proximity of metasedimentary rocks indicate that dehydration melting involving Ms, Bt, Pl and Qtz was a viable mechanism for formation of these rocks.

Conclusions

Felsic granulites of leucogranitic character representing a significant portion of granulite-facies rocks exposed in the Ohe crystalline area, north

Bohemia, can be considered as products of melting and crystallization at high pressures and temperatures. Comparison of the natural assemblages such as given above with experiments studying melting in granite system under HP-HT and both water-present and water-absent conditions (e.g. Huang and Wyllie, 1981) is a useful way towards understanding processes of their formation.

References

Huang W.L., Wyllie P.J. (1981) *J. Geophys. Res.*, **86**, 1015–29.

Vrána S., Jakes P. (1982) *Vst. hst. úst. Geol.*, **57**, 129–43.