Abstract

Variscan dike swarms associated with the Central Bohemian Plutonic Complex (CBPC) at the boundary between the Teplá-Barrandian and Moldanubian Units of the Bohemian Massif represent one of the most interesting geological phenomena. Frequency of dykes and their chemical variability do not have any comparable analogy in the whole European Variscides.

This work is focused on the study of dyke rocks in the NE periphery of CBPC in geologically very complicated area with intrusions of predominantly deformed granitoids, contact metamorphosed sediments and magmatic rocks of „Islet Zone“ with different protolith ages (forming remnants of the original roof of CBPC), deformed basic rocks of uncertain origin and age. The area extends up to the western boundary of the northernmost part of the Moldanubian high-grade metamorphic complex, the boundary itself being also tectonically problematic.

Several localities with dyke rocks under study are situated in the area east of Senohraby (SE of Prague), on the northern side (right coast) of the Sázava river, and extend up to the area of Stříbrná Skalice. This area is rich in dykes of gabbro to diorite porphyry accompanied in some places with tonalite (rarely quartz diorite) porphyry and more rarely with amphibole lamprophyres (spessartite). Significantly younger dykes of syenite porphyry (microsyenite) were studied only marginally.

The specific feature of both gabbro and tonalite porphyries is presence of many types of amphiboles, which have been studied in detail. On the base of both microscopic and detail microprobe study origin of various amphibole compositions were attributed to conditions of (i) magmatic crystallization (early for amphibole phenocrysts to late for some amphibole in the groundmass), (ii) early subsolidus stage with the first occurrence of recrystallization processes, and (iii) post-magmatic to metamorphic overprint or partial recrystallization.

On the base of amphibole thermobarometry we have found approximately pressure-temperature conditions for some types of amphiboles. Application to all varieties is impossible due to the whole-rock chemistry, too specific compositions of some amphibole varieties, and other restrictions given by the authors of individual methods. Nevertheless, two trends of amphibole evolution were established, the first from temperatures about 900°C and pressure about 3,5 kbar in gabbro porphyries, the second from about 800°C and pressure about 1,5 kbar in tonalite porphyries.

Gabbro to tonalite porphyries are calc-alkaline (though transitional to tholeiitic in some old discrimination diagrams). These rocks are generally similar to mafic to intermediate to acid plutonic rocks of the calc-alkaline Sázava Suite (the oldest member of CBPC), geologically being somewhat younger as the dykes intruded rocks including the plutonic members of the Sázava Suite itself.

The geochemical record of these dikes shows very strong affinity to the supra-subduction conditions and their origin cannot be interpreted in any other ways. The most strong arguments are

high ratios of some LILE/HFSE trace and minor elements and unusually high Th/Ta ratios typical both for gabbro and tonalite porphyries and rather extreme in spessartite.

A limited number of whole-rock analyses from different and scattered dykes does not allow unambiguous interpretations of magmatic evolution of individual pulses. However, it is quite clear that tonalite porphyries are not any direct results of the magma fractionation of gabbro porphyry magma, and mafic spessartite represents some different portion the more mafic and primitive magma that originated and evolved quite separately. Gabbroic and tonalitic magmas of the dykes under study originated from different sources and their evolution (fractionation, perhaps accompanied by mixing) took place separately.

The signs of deformation and partly metamorphic recrystallization, earlier documented mainly in plutonic rocks of the area, are observable also in the calc-alkaline dyke rocks rea but are rather weak.

The peak conditions of partial metamorphic recrystallization of gabbro and tonalite porphyries (which only accompanies and modifies largely preserved igneous mineral assemblages) may be assigned to conditions of the amphibolite facies, which corresponds with the temperature scale of recorded deformation of plagioclase and quartz. No signs of formation of typical mineral associations of the greenschist facies, or comparatively low contact-metamorphic conditions with relatively significant amounts of water, were observed. A possible but still uncertified cause of the weak deformation and weak but relatively high-temperature overprint of igneous rocks in the whole area adjacent to the western boundary of the high-grade Moldanubian metamorphic complex could be the Variscan exhumation of hot, already to significant degree dehydrated rocks complexes of the Moldanubian Unit after intrusions of plutonic rocks of the Sázava Suite.