

English abstract

The investigation of high- to ultrahigh-pressure rocks in the Bohemian Massif occurring as small bodies enclosed in surrounding rocks with a low degree of metamorphism was always focused on their main metamorphic event in granulite facies conditions at very high temperatures. However, recent studies have shown that these rocks underwent a high-pressure metamorphism that preceded the subsequent high-temperature overprint and exhumation of those rocks. The scientific publications that comprise this dissertation thesis present petrological, mineralogical and geochemical research of these (ultra)high pressure rocks from various parts of the Bohemian Massif that have the potential to preserve information about their pre-exhumation history. The findings of the inclusions of high-pressure phases in metamorphic minerals and, in particular, the study of major and trace elements zoning in garnets together with thermodynamic modelling allowed us to describe new temperature-pressure conditions and to refine the metamorphic paths of these rocks.

The felsic and mafic granulites of the Kutná Hora Complex in the Moldanubian Zone and the Rychleby Mountains in the East Sudetes preserve the evidence of prograde metamorphism. In addition to the inclusions of phengite and omphacite in the garnet cores, the multiple zoning of major and trace elements in garnet declares their prograde evolution. Using thermodynamic modelling, it has been calculated that these rocks have undergone a complex metamorphic evolution from their initial stage at low temperatures and pressures (400-500 °C / 0.8-1.0 GPa) up to UHP conditions in the coesite and diamond stability field. This prograde path took place under a very steep geothermal gradient in the subduction zone. After a partial isobaric ascent of the rocks to the upper mantle levels, significant heating under the granulite facies conditions affected these rocks. This second metamorphic event is linked to the intrusion of a hot mantle magma that penetrated mantle/crust boundary due to the slab break-off and also to later Variscan processes.

The composition of monomineral and polyphase inclusions in garnets from eclogites and clinopyroxenites, which are enclosed as boudins in garnet peridotites in the Moldanubian Zone, shows their origin as derivatives of the lithospheric mantle above the subduction zone. The temperature-pressure conditions, calculated on the base of preserved prograde zoning in garnets, suggest that the high temperature overprint in granulite facies was relatively short and did not result in total homogenisation of those rocks. This short-term event is also documented in the surrounding felsic granulites. The probable occurrence of the subduction environment and part of the Variscan suture in the Bohemian Massif is also documented by the bodies of eclogites, which occur in the form of a 250 km long bend spreading across the Moldanubian Zone from the southwest to the northeast up to the East Sudetes. Their texture relationships and temperature / pressure conditions (600-650 °C / 2.3 GPa) allow us to determine that these rocks have undergone a steep geothermal gradient during the prograde metamorphism. These hypotheses are also supported by findings of high pressure / low temperature amphiboles of taramitic composition as inclusions in garnets.