

Petrophysical properties of HP metabasites of the Kutná Hora Unit

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Metabasites of the Kutná Hora Unit preserve records of a prograde metamorphic history with UHP peak equilibration. Mineral UHP/HP assemblages, prograde garnet zoning and sets of relict mineral inclusion indicate either missing, or shorter and less intense thermal re-equilibration than that in the SE branch of the Moldanubian block. Eclogites together with ultrabasics represent the highest metamorphic product, forming minor allochthonous bodies enclosed in gneissic environment.

Physical properties of KHC eclogites are the criteria documenting the exhumation mechanism from the mantle depths. There are but few older single data from comparative petrophysical studies for these rocks although they anchor all the petrological and mineralogical data in the geophysical image of exhumation geo-mechanics. Therefore we measured few parameters for the studied set of eclogites and related rocks. Few older petrophysical measurements are available in the previous reports by Babuška and Vaňková (Babuška et al. 1078). Some derived values on Cs¹³⁷ gamma-ray absorption were published, however, the data from accurate measurements were not provided (Vaňková et al. 1979). Elastic wave velocity, and also related absorption coefficients closely correlate with mineralogical densities of eclogites. Volume density, mineralogical density and porosity of 11 eclogites and few ultrabasic and amphibole-bearing rocks were newly measured. The mineralogical density (Dm) reflects a specific weight of a mineral framework in a rock, and

depends only on proportions of minerals with their respective densities. Dense minerals are usually garnets, pyroxenes, kyanite, rutile, and ore minerals. Amphiboles show lower density values. Low-density minerals are typically Na-plagioclase and quartz. Eclogite Dm values vary between 3.376–3.526 g/cm³ with the exception of amphibolized varieties (3.055 g/cm³). Remarkably high Dm values were detected for a fresh eclogite from Úhrov (3.519 g/cm³), and for partially retrogressed eclogite from Bořetice–N (3.461–3.526 g/cm³) comparable to older data from Poličany and Úhrov. Average measured Dm is rather high, 3.445 g/cm³, exceeding the average eclogite value of 3.392 g/cm³ for metamorphic terranes. If compared to the expected density changes in basaltic layer of a subducted lithospheric plate, the measured > 3.400 g/cm³ Dm values correspond to 100–300 km depths. As there is almost no presumed secondary Dm change, a fast uplift theory is also confirmed. Eclogites display no magnetic susceptibility anomalies, i.e., low content of ore minerals. Low densities of 2.93–2.94 g/cm³ were reported for Qtz-bearing varieties, which is indicative of SiO₂ phase transitions from coesite (Dm≈2.91 g/cm³). Porosity of eclogites is extremely low up to 1%, increases to 4,6 % only in case of Bořetice–S mylonized samples. These porosity values indicate extremely low penetrativity and hence also low efficiency of metamorphic reactions.