# Record of metamorphic and metasomatic processes at the contact of felsic and mafic rocks in high-temperature conditions (Dunkelsteiner Wald granulite massif, Bohemian Massif)

TEREZA ZELINKOVÁ[1,2] – MARTIN RACEK[1] – ONDREJ LEXA[1] – PETR JEŘÁBEK[1]

[1] *Institute of Petrology and Structural Geology, Charles University, Albertov 6, 12843, Prague, Czech Republic; tereza.zelinkova@natur.cuni.cz; martin.racek@natur.cuni.cz; ondrej.lexa@natur.cuni.cz; jerabek.petr@natur.cuni.cz*

[2] *Czech Geological Survey, Klárov 3, 118 21 Prague 1, Czech Republic*

Dunkelsteiner Wald granulite massif is situated in the Gföhl unit of Lower Austria and is dominantly formed by felsic granulite, however it contains large number of smaller mafic to ultramafic bodies such as pyroxenites, peridotites, and eclogites. The contact of the felsic granulites with these bodies is sometimes accompanied by occurrence of mafic and intermediate granulites with specific mineralogical and textural characteristics.

Primary mineral assemblage of garnet pyroxenites and mafic granulites is similar and formed by clinopyroxene and garnet, some samples may contain kyanite and quartz as inclusions in garnet. Mafic granulites may moreover contain aggregates of Ca-rich plagioclase grains hosting grains or symplectites of spinel and/or sapphirine, which are interpreted as relics after kyanite. The garnet pyroxenites show rather limited extent of metamorphic overprint reflected by formation of ortopyroxene and plagioclase coexisting with dipsidic clinopyroxene. In the mafic granulites the degree of the overprint is much higher. The matrix re-equilibrated mineral assemblage is formed by garnet, clinopyroxene, plagioclase and orthopyroxene with minor amphibole, spinel and saphirine. Texture of mafic granulites is characterizated by formation of plagioclase around the garnet porfyroblasts and high amount of plagioclase inclusions partially or completely enclosed in the garnet rims. The matrix is formed by coarse-grained symplectites of Al-rich clinopyroxene with Ca-rich plagioclase and orthopyroxene.

Clinopyroxene in both lithologies is jadeite- and CaTs-rich (up to 25 % of jadeite and 13 % of CaTs) with orthopyroxene lamellae and compositional zoning characterized by Al and Na decrease toward the rims. The chemical composition of garnets in both lithologies is characterized by a compositional plateau in the core with high Ca content. The rim composition is in intermediate and mafic granulites and garnet pyroxenites drastically affected by diffusion resulting in considerable Ca-depletion associated with enrichmend in Mg and Fe. Primary garnet growth zoning in studied lithologies can be traced only by Cr-poor core.

The mineral assemblage of felsic granulites was formed by garnet, kyanite, quartz, plagioclase, K-feldspar and rutile. The primary mineral assemblage of the intermediate granulites preserved as relics was similar but additionally contained clinopyroxene. However the dominant mineral assemblage is characterized by occurrence of orthopyroxene in matrix and kyanite breakdown to mixture of corundum and clinozoisite surrounded by garnet corona.

P–T conditions of the metamorphic evolution of the selected lithologies were estimated by thermodynamical modelling. Primary mineral assemblage of mafic granulites and garnet pyroxenites was formed in eclogite facies under conditions of 25 kbars and 900°C, then these rocks were isothermally decompressed to 10 kbars corresponding to granulite facies. Metamorphic evolution of intermediate and felsic granulites is similar and characterized by decompression with temperature increase starting at the border of eclogite-granulite facies 13–16 kbars and 800°C to 6–11 kbars and 900–1000°C.

The whole rock geochemical characterization of the lithologies has shown clear chemical similarity of mafic granulites with garnet pyroxenites, but mafic granulites are considerably depleted by MgO, FeO and LREE and enriched by $K_2O$, $SiO_2$, $Al_2O_3$ and $Na_2O$. Similarly, there is an apparent affinity of intermediate granulites to felsic granulites, but intermediate granulites are depleted by $SiO_2$, $K_2O$ and $TiO_2$ and enriched by MgO, $Al_2O_3$, CaO, $TiO_2$ and LREE.

The similarity of mafic granulites with garnet pyroxenites and felsic granulites with intermediate granulites in chemical composition, mineral assemblages and P–T evolution can signify, that mafic and intermediate granulites represent lithologies that were derived from garnet pyroxenites and felsic granulites as a result of metasomatic processes at high tempereture conditions at the contact of these chemically contrasting lithologies.