

## SUBMARINE HYDROTHERMAL AND SUPERIMPOSING GARNET FORMING METASOMATIC PROCESSES IN THE SZARVASKŐ BASALT FORMATION (NE-HUNGARY)

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The Bükk Mts. in NE-Hungary contains Triassic and Jurassic submarine basaltic rocks in the Szarvaskő Unit and in the Darnó Unit, which are related to the different evolutionary stages of the Neotethys. These rocks are considered to be fragments of Dinaridic origin and were displaced to northeast along the Periadriatic-Balaton-Darnó- and Mid-Hungarian Lineaments during the Oligocene-Early Miocene. These different magmatic blocks are found in the same accretionary mélange (HAAS & KOVÁCS, 2001; DIMITRIJEVIĆ *et al.*, 2003; KISS *et al.*, 2011).

This study focuses on a small quarry located in the Jurassic magmatic complex of the Szarvaskő Unit. This magmatic complex contains commonly gabbro, rarely ultramafic rocks as well as an extended pillow basalt series. According to HARANGI *et al.* (1996) and AIGNER-TORRES & KOLLER (1999), the formation of these series is most likely related to a back-arc basin, opened in the area of the Neotethian realm.

After completing fieldwork, in order to characterize the collected samples of the different pillows and their alteration mineral assemblage, macroscopic, stereomicroscopic, polarizing microscopic and SEM+EDX observations, XRPD measurements were performed.

The investigated rocks of the quarry represent the peperitic facies *s.l.* (i.e. local admixture of basaltic lava into water-soaked siliciclastic sediment) of a subaqueous lava-flow complex. However, a dolerite block was observed also, found in tectonic relationship with the pillow basalt series at the eastern part of the outcrop.

In the highly altered pillow basalt, channel-like cavities of 1–2 centimetres in diameter occur. In addition to the macroscopically observable pyrite, chalcopyrite, barite and gypsum (the latter formed as alteration product of the pyrite) were also found in the vugs. The formation of this mineral assemblage – together with the chlorite, albite, quartz and titanite hydrothermal alteration assemblage in the host rock –, were most likely formed in a submarine hot fluid circulation system of

greater importance than a simple cooling-related hydrothermal process.

Completely altered basalt also occurs in some blocks of the outcrop. This rock is composed mainly of Ca-garnet (mostly grossular with high manganese content), chlorite and quartz. These minerals form a relict, porphyry-intersertal texture, replacing the original minerals of the basalt, however, the macroscopic appearance of the rock also resembles to its original pillow structure. This alteration parageneses can be explained by the effect of a Ca-metasomatic process, similar to the *sensu lato* rodingitization, superimposing the earlier, above discussed submarine hydrothermal mineralization. This is supported also by the rare presence of special minerals, like zircon and apatite, however, in our case, the formation of the garnet-bearing rock is more likely related to processes happened in a ridge-setting (reported also in Norway by AUSTRHEIM & PRESTVIK, 2008), different from formation of *sensu stricto* rodingite.

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