METASOMATIC-HYDROTHERMAL PROCESSES ALONG THE CONTACT ZONE OF A TEPHRITIC SILL AND BLACK SHALE IN THE EASTERN MECSEK MTS., SOUTH-HUNGARY

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In the Mecsek Mts., alkaline basaltic-phonolitic volcanic rocks and dykes of Lower Cretaceous age are widespread. The alkaline igneous activity is related to rifting events connected to the opening of Central European branches of the Tethys Ocean. Alkaline dykes intrude into Lower-Middle Mesozoic sedimentary rocks at many places of the Mecsek Mts. In the Réka valley, the area of this study, a tephritic sill intruded into a Toarcian, organic-material rich black shale. This paper summarizes the mineralogical and petrographical characteristics of the contact between the upper margin of the sill and the covering shale.

Rock-forming minerals in the black shale are clay-, carbonate- and feldspar minerals associated with small amounts of quartz and pyrite. The sill consists of oligoclase, analcime, Ti-augite and biotite as major minerals with apatite, pyrite and titanomagnetite as accessories. Texture of the rock is ophitic-subophitic. Occurrence of small pegmatoid lenses (ca. 10 cm in diameter) is also typical for the sill. The pegmatoid lenses consist of anorthoclase, aegirine, aegirine-augite, Ti-augite with aegirine coronas, biotite, analcime, titanomagnetite and apatite. Occurrence of these pegmatoids indicates enrichment of magmatic fluids in pockets during the final stage of crystallization.

The first signs of contact-metasomatic alteration can be found about 2 meters from the black shale in the tephritic sill. Here, calcite appears in the groundmass of the igneous rock that develops intergranular texture. Towards the black shale, the amount of calcite increases and calcite also appears in the form of infillings of amygdules which also start to develop towards the contact. Increase of the amount of calcite is also associated with the change of the rock texture from intergranular to intersertal and then to intersertal-amygdaloidal. Biotite occurs in groundmass far from the contact; however, close to the contact it forms knot-like aggregates and infillings in amygdules. In the zone of appearance of biotite in knots, pyroxene disappears from the rocks. Closer to the contact pyrite replaces biotite. About ten centimetres from the contact quartz appears in association with the amygdule-filling calcite. The maximum size of amygdules (1 cm diameter) occurs about 3–4 cm from the contact. In addition to amygdules, occurrences of tubular gas-cavities (also filled by calcite) are also typical to this zone which therefore can be considered as the zone of maximum enrichment in volatiles. In the chilled margin, right along the contact, amygdules are absent and the texture of rock is microintersertal. The gradational change of texture and mineral composition, together with the appearance of amygdules and their variation in size point towards the process of volatile enrichment of the crystallizing melt. The source of excess H_2O, CO_2, and S is evidently the clay-mineral, carbonate and sulphide rich country rock. The cooling fractures in the sill are parallel with the bedding of the black shale, thus not only chemical, but physical effect of the country rock on the sill can be recognised. The thermal effect on the pore fluids of the black shale resulted in a vigorous fluid circulation yielding hydrothermal brecciation of the shale along the contact. The breccia is cemented by quartz and calcite. Secondary fluid inclusions of these minerals have homogenization temperatures around 120 and 130 °C. These inclusions with about 4–5 NaCl equiv. wt % salinity mark the final stage of pore-fluid circulation.

The secondary mineral paragenesis was developed during weathering of primary and metasomatic-hydrothermal assemblages and it consists of hematite, limonite and gypsum. The Ni-content of pyrite resulted in the formation of dwornikite during these late processes.