HYDROTHERMAL MINERALIZATION IN THE HÁRSHEGY SANDSTONE FORMATION OF MIDDLE OLIGOCENE AGE IN THE BUDA HILLS, HUNGARY

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The distribution of the Hárshegy Sandstone Formation, which is a transgressive, coastal formation of Middle Oligocene age is strongly defined by the NE–SW striking Buda Line that forms the eastern boundary of its extension. The Buda Line was a paleogeographic boundary in the Late Palaeogene and location of an intensive post-volcanic activity as well (FODOR, 1995). The sandstone is strongly silicified in what is called the Buda Zone, a 5–20 km wide belt along the western side of the Buda Line (BÁLDI & NAGYMAROSY, 1976). Stratigraphic and tectonic evidences suggest a Late Oligocene age for silicification (BÁLDI & NAGYMAROSY, 1976). A particular interest in this silicified zone is related to the elevated As and Au concentrations (KORPÁS & HOFSTRA, 1999)

Hydrothermal formations in the typical facies of Hárshegy Sandstone were studied in two reference areas: in the surroundings of Pilisborosjenő village (Köves-bérc [hereinafter Köves Hill] and Ezüst Hill) and in the vicinity of Csobánka village (Majdán-nyereg [hereinafter Majdán Saddle]). In both areas, hydrothermal mineralization consists of chalcedony and barite veins. Most of these veins are usually rather thin (1–5 cm in thickness) and appear to be simple extensional fractures, however, occasional displacement can also be observed along the veins. The density of veins is uneven. In the vicinity of Pilisborosjenő and especially on the Köves Hill, siliceous veinlets form dense stockwork, whereas barite veins are more common on the Majdán Saddle where chalcedony veins are subordinate. The orientation of the chalcedony veins is dominantly WNW–ESE, and that of the barite veins is NNW–SSE (Fig. 1). Barite veins always cut through chalcedony veins, clearly indicating their younger age. Considering the mostly simple extensional nature of veins and their relative age relationships, their orientation fits with the model of stress-field variation during the Late Oligocene–Miocene (MÁRTON & FODOR, 2003; BADA *et al.*, 1996).

chalcedony barite

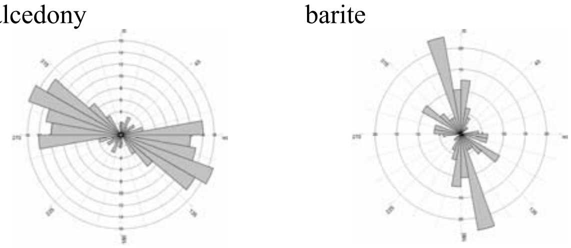

Fig. 1: Strike orientation of veins.

Chalcedony veins often have argillic alteration selvage mainly consisting of kaolinite with a small amount of illite. Hematite and limonite are also present in the alteration zone, which is usually not wider than a few centimetres. Veins with barite do not contain other minerals and have sharp contact with the sandstone without an alteration halo. Barite veins have open spaces therefore the crystals are usually euhedral. Barite crystals most commonly have simple orthorhombic-tabular morphology in most of the thin veins, however, a definite zoning in distribution of various habits of barite was observed in the major and thickest vein (approx. 2 m in thickness) on the Majdán Saddle. There the first phase of the crystallization of barite was related to the brecciation of sandstone and the habit of crystals is determined by pyramidal and prism faces in addition to the {001} form (Fig. 2).

Fig. 2: Barite from breccia. Majdán Saddle, Csobánka.

Crystals formed in open fractures beside the breccia have more simple, orthorhombic-tabular habit with the dominant {001} form associated with smaller faces of the {100} and {010} prisms. Far away from the breccia zone, open fractures contain thin lamellae of barite with the dominant {001} form. Variation of crystal habit as a function of distance from the central hydrothermal zone probably reflects variation of temperature and saturation of solution for barium and sulphate. This observation can be used in prediction of occurrence of major fluid flow zones precipitating barite in the sandstone. Fluid inclusions in the barite crystals were subject of homogenization and cryoscopic investigations. Only the larger, rhombic-tabular crystals from the Majdán Saddle contained two-phase (aqueous liquid + vapour on room temperature) inclusions sufficient for study. After the investigations, it could be said, that these barite crystals precipitated from low-salinity solutions during a low-temperature (T = 50–70 ºC) hydrothermal process.

References

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