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MINERALOGICAL STUDY OF THE SÁTORKŐPUSZTA CAVE, DOROG, HUNGARY

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The aim of our work was to give a detailed mineralogical description of the mineral precipitates of the Sátorkőpuszta Cave and to apply our results for setting up a genetic model for the cave. The Sátorkőpuszta Cave was discovered 60 years ago and has been famous for its rich gypsum encrustations. The cave opens on the SE slope of the Nagy-Strázsa-hegy (Nagy-Strázsa Hill) near Dorog, at a distance of only 35 km NW from Budapest.

The cave is hosted by Upper Triassic Dachstein Limestone. That formation and other, different limestone formations are characteristic for the closer and broader geological surroundings of the Nagy-Strázsa Hill. An interesting exception is the Tábla Hill, situated to the south of the hill at a short distance, built up of Eocene–Oligocene and Miocene volcanics.

The mineral precipitates of the cave were thoroughly mapped and a representative set of samples was collected (taking also the serious environmental protection regulations into account). The collected samples were studied under the stereomicroscope. X-ray powder diffraction (XRD) was applied for phase identification. Scanning electron microscopy (SEM, equipped with EDX analyser) was carried out on thin sections to reveal the textural relationship between the identified phases. Finally, dissolution experiments were carried out on the cave-hosting limestone to reveal the mineralogical composition and the amount of the insoluble residue.

According to the on-spot observations several 10 cm thick veins built up of well-crystallized calcite stand out from the walls and ceilings in the cave. These veins were obviously formed in the hosting limestone before the formation of the cave, and they were disclosed during the dissolution of the cave due to the lower solubility of the coarse calcite crystals than that of the fine calcite matter of the host rock. Iron oxide(-hydroxide) pseudomorphs after crystalline pyrite can also be found in these primary calcite veins.

The lower level of the cave is rich in mineral precipitates. Recent formation of dripstone in limited amounts can be traced in some parts of that level; however, the dominant phase covering the walls is gypsum. Gypsum forms even large columns. At the recent bottom of the cave clay-sized material, consisting mainly of kaolinite and in lesser amount quartz, blocks the access to the deeper parts.

The most interesting mineral assemblage, giving also a key to the formation of the cave, is a rhythmic precipitation of finely banded dolomite and gypsum forming a cover on the "bottom clay". Gypsum (second generation) may also fill the desiccation cracks of dolomite (Fig. 1). That texture clearly proves that dolomite was a primary precipitation (not a detrital phase) in one of the last stages of the cave formation processes. The crust-forming dolomite and gypsum on the surface of kaolinite may be considered as evaporites.

Based on the dissolution experiment the clay-sized kaolinite and quartz in the cave can partly be considered as the insoluble residue of the limestone. It should be noted, however, that the size of the cave, *i.e.* the amount of dissolved limestone in itself cannot account for the amount of kaolinite that has been accumulated on the bottom of the cave.

Based on the mineralogical results, the formation of the cave consists of at least four phases: (1) hole formation, dissolution of the limestone. During that phase calcite- and pyrite-bearing veins got disclosed, while the insoluble residue of the limestone accumulated on the floor of the cave. This stage was followed by (2) the oxidation of pyrite and the evaporitic, rhythmic precipitation of dolomite and gypsum. In the first part of stage (3), due to the retreat of water, desiccation cracks formed on the dolomite-gypsum crust, followed by the precipitation of large amounts of calcite and the second generation of gypsum (on the walls of the cave and in the desiccation cracks of dolomite). In the last stage (4), dripstones precipitated from the infiltrating water.

Further studies are planned to find out the source of kaolinite, the large amounts of sulphur necessary for the gypsum and to trace the relationship between the cave and the nearby volcanic rocks.

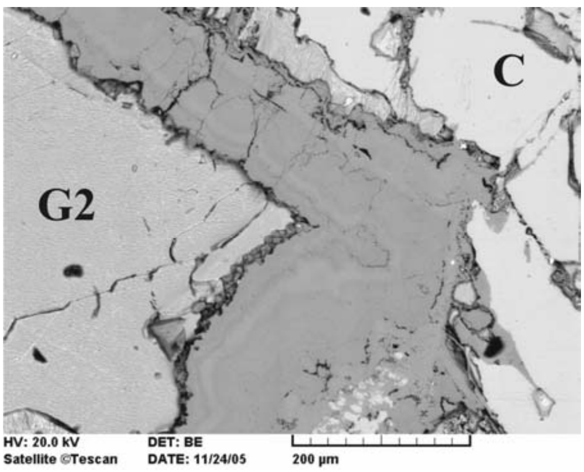

Fig. 1: Continuous bands of rhythmic precipitation of dolomite on a calcite crust (C) covering the bottom kaolinite. In the darker zones submicrometre-sized fine gypsum crystals ("gypsum generation 1") formed together with dolomite. Later a second gypsum generation (G2) of much coarser crystals filled the desiccation cracks of dolomite and the new pores (between calcite "C" and the dolomite crust) formed by the dissolution of calcite.