MINERALS OF THE JÓZSEF HILL CAVE, BUDAPEST, HUNGARY

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In 1984, spelaeologists under the guidance of Szabolcs Leél-Őssy and Péter Adamkó explored the József Hill Cave, the most beautiful and most abundant in minerals member of the cave group in the environs of Budapest. As to its character and formations, this typical thermal karst cave, known at present in a length of 5.6 km, is similar to the Lechuguilla Cave (New Mexico, USA), called the most beautiful cave in the world – even if the dimensions of the mineral precipitations and the passages are not to be mentioned in the same breath.

In the laboratory of Stein-Erik Lauritzen, University of Bergen, Norway, in 1996, as well as in the laboratory of the Eötvös Loránd University of Budapest during 2001–2002, uranium series dating measurements were carried out on the formations. The obtained data helped a lot in determining the genetics of the precipitations.

On the main passage level of the cave, the host rock can be investigated only at a few places, as the mostly white crystal coating covers uninterruptedly the wall almost everywhere. Altogether 7 minerals can be examined and distinguished with the unaided eye. The presence of 6 minerals was demonstrated by X-ray powder diffraction examinations and further 3 minerals were detected by heavy mineral analysis. Among them, mainly carbonates and sulphates, as well as oxides–hydroxides and silicates could be found. The two dominant mineral species (gypsum and calcite) can be observed in very diversified forms of appearance.

Out of the 9 forms of appearance of the gypsum crystals, the 0.5–1.0 m gypsum chandeliers that hang down from the ceiling are the most spectacular ones. Generally, the side walls are covered by small crystalline gypsum coating. At several places, on the top of the some cm thick gypsum crust 1–5 cm gypsum crystals, while at other places 1–3 mm wide, 1–2 cm long needles are sitting. The pencil-thick, 10–15 cm gypsum flowers and gypsum snakes as well as the straggly agglomeration of the hair-thin but locally 50–90 cm long crystal needles, called needlegrass, are precious gypsum formations.

The material of the gypsum precipitations may be derived partly from the sulphate content of the former thermal springs, partly from the pyrite content of the more than 10 m thick marl layer covering the cave. The coatings and the needlegrass are living formations that precipitate from the infiltrating water and the cave aerosol.

With its 13 separate forms of appearance in the cave, the calcite occurs most frequently as common peastone. The 5–15 cm long sheaf-like clusters, standing out perpendicularly from the side wall, are built up of green pea-sized deformed spheres of layered structure. There are angular and coral peastones, as well. All of these peastones came into being from the mist above the evaporating warm water cave lake that condensed on the side walls some tens and hundreds of thousand years ago, respectively.

The glass ball peastones are regularly spheroidal yellowish formations of about 0.3–0.8 cm diameter with a smooth surface. Unlike the most peastone varieties, they precipitated from the slowly flowing or dripping cold water. According to the results of the uranium series dating, they are only some thousand years old.

From the point of view of age determination, the 0.2–3.0 cm thick cave raft and several cm thick flowstone (multigenerational calcite crust) accumulations, covering the side wall at a lot of places, are the most important, as they were precipitated shortly after the dissolution of the cave, near the surface of the warm water, filling the cavity. The results of their examination refer to the fact that the passages of the József Hill Cave were dissolved about half a million years ago.

In the cave, the calcite is represented by several other precipitation types (e.g. dripstone, dog teeth, tetaratas, basin fingers, etc.), as well.

As to the spectacle, a determinant representative of the crystals of the cave is the aragonite, the 1–2 mm thick crystalline needles of which form hemispheres of 1–3 cm diameter and 4–8 cm long clusters. The 30,000–200,000 years old crystalline needles are sitting generally on the top of the peastone grains. The infiltrating waters in the cave have already re-dissolved the considerable part of the aragonite needles.

Besides the spectacular crystal formations, the clay minerals: kaolinite and illite, accumulating from the detritus of the carbonate rocks, occur on the bottom of the passages in a considerable (locally several m) thickness.