GYPSUM IN TAJNA JAMA AND IN THE CAVE KUBIK

SADRA V TAJNI JAMI IN JAMI KUBIK

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Mihevc, Andrej: Gypsum in the caves Kubik and Tajna jama

Gypsum is frequent cave mineral but almost unknown in the slovenian karst caves. The aim of the article is to describe two finding sites of gypsum, in the caves Kubik and in Tajna jama, where gypsum is deposited in a form of big crystals within the cave clastic sediments. Possible origin of gypsum occurrence could be pirites oxidation and reaction of sulphuric acid with limestone.

Key words: Slovenia, Tajna jama, Kubik, cave gypsum

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Sadra je pogost jamski mineral, v slovenskih jamah pa je skoraj nepoznan. Namen sestavka je opisati dve nahajališči sadre, v jami Kubik ter Tajni jami, kjer se je sadra izločila obliki velikih kristalov v jamskih klastičnih sediementih. Možen nastanek sadre je oksidacija piritov, ter reakcija žveplene kisline z apnencem.

Ključne besede: Slovenija, Tajna jama, Kubik, sadra,

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After calcite and aragonite gypsum is the third most common cave mineral (C.HILL & P.FORTI, 1986). According to the slovenian speleological literature it was till now found in Kamniška jama only (J. URBANC, 1982). According to oral information gypsum is met in Marijino brezno near Škofja Loka and in Šimnova - Gorjanska jama (oral infromation F. ŠUŠTERŠIČ).

Gypsum is hydrated calcium sulfate, $CaSO_4 . 2 H_2O$. In the caves it appears under the form of colourless or white crystals, fibres, blossoms, crusts or powder. The mineral has monoclinic symmetry, swallow-tailed twins are common. It is soft mineral and could be razed by nail. It is well soluble in the water.

The origin of gypsum which is found in the caves is different. The most frequently it occurs by oxidation of sulphidic minerals, f.e. pirite. Iron oxide and sulphuric acid occur during the oxidation. They react with calcite in limestone and gypsum and CO_2 are the result. In last time to this process an important role is attributed by genesis of the initial channels in karst (T.K. BALL & J.C.JONES, 1990).

Gypsum is better soluble than the carbonate rocks are. This is why it is usually found in more dry caves or in dry parts. It was brought there by the capillary forces and the gypsum was deposited when the water evaporated.

GYPSUM IN TAJNA JAMA NEAR ANDRAŽ

Tajna jama lies north from Polzela on the Ponikve plateau. The entrance part was known by E. PRETNER since 1939. In 1961 D. NOVAK mentions that the chimney above the entrance part probably promises the continuation. The chimney was later climbed by the member of CC Črni galeb and they surveyed more than 1000 m of passages (D. NARAGLAV, 1978). In the cave register D. NARAGLAV mentions beside the aragonite speleothems and clusters big crystalls of various forms which precipitated in the loam. During the visits in 1975 and in 1992 it was proved that these are the gypsum crystals.

According to Geological map, sheet Celje the cave lies in light brown bedded Dachstein limestone. The beds are almost horizontal, uncrushed and being cut by some faults in the entrance part only clearly expressed in the passages morphology.

The cave was shaped by two water courses. The entrance part was shaped by the brook gathering the water in Oligocene rocks, sandstones, marls and andesite tufs. All these rocks could be found in the entrance part of the cave in form of gravels or finer sediments. About 20 m behind the entrance the brook flows into the siphon. The remaining, much bigger part of the cave was shaped by the water course which flows from narrow till now inaccessible

channel in the northern side of the cave and flows towards the entrance to the same siphon. This water flow is probably the same that sinks below the farm Zalesnik in Srednja Tajna about 50 m north from the extreme part of the cave.

In passages morphology two parts could be distinguished. The entrance part is a network of various channels shaped around the faults and in various altitudes. The bottom is covered by coarse sediments, gravel and sand.

Bigger, inner part of the cave is a simple passage oriented N-S and meandering in ground plan. In the passage's cross section two development stages are expressed. In the first one 2-3 m wide passage of oval or lense form developed in phreatic conditions along the bedplanes. The incision of 0.5 m

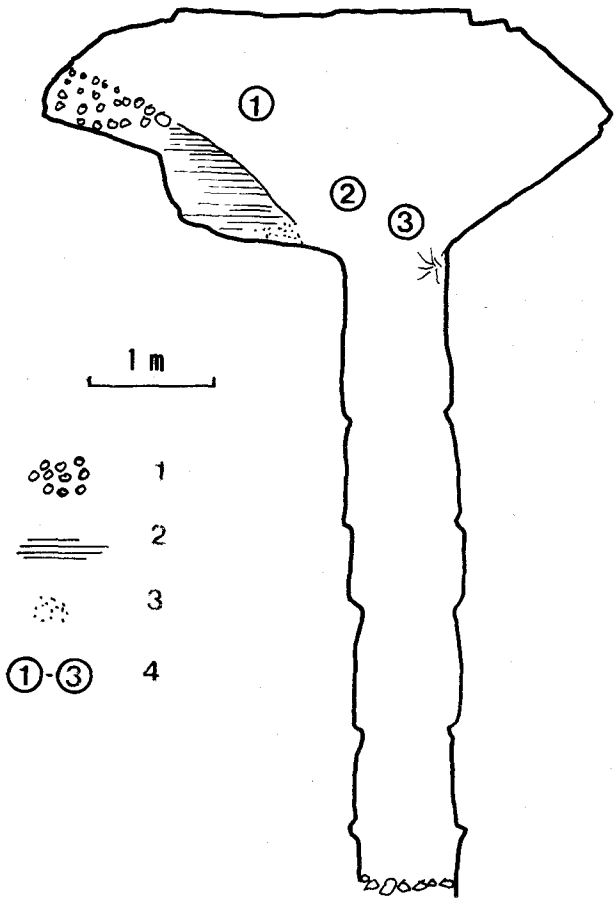

Fig. 1 Passage cross section in Tajna jama with gypsum finding sites
Slika 1. Profil rova v Tajni jami z nahajališčem sadre.
Legend: 1. non-carbonate gravel, 2. loam, 3. sand, 4. gypsum finding site
Legenda: 1.nekarbonatni prod, 2. ilovica, 3. pesek, 4. nahajališča sadre

wide canyon up to 10 m deep, followed. In its bottom the actual cave brook flows.

Gypsum is found on several places in the cave. Some are smaller white blossoms on the walls and on the ceiling of the passage, the majority of gypsum is found in the sediments which are preserved in lower part of wide oval profile of the passage but 10 m above the actual water flow. Crystals, deposited on the loam are either in 1-2 m thick needles or agglomerated into up to 4 cm thick swallow tailed-crystal twins. They are not easy shelled off the loam as they usually break. The biggest being washed off the loam by the percolated water was 25 cm long, strongly corroded. Gypsum growing in the sand has smaller crystals.

The origin of gypsum in the cave is not quite sure. The gypsum in form of crystals in the loam and sand could be transported in the solution by periodical flood water of the sinking stream. But according to other signs the floods do not reach so high and also gypsum appears in form of blossom on the rock thus this possibility could be discarded.

More probably the gypsum was brought in by the water which penetrates in the passage by the bedplanes and small fissures from the near rocks. The inflow of water saturated by sulfates is slow and controlled by capillary forces. When the water evaporates from the sediment the gypsum crystals grow. The same origin has the gypsum found in form of blossoms on the walls.

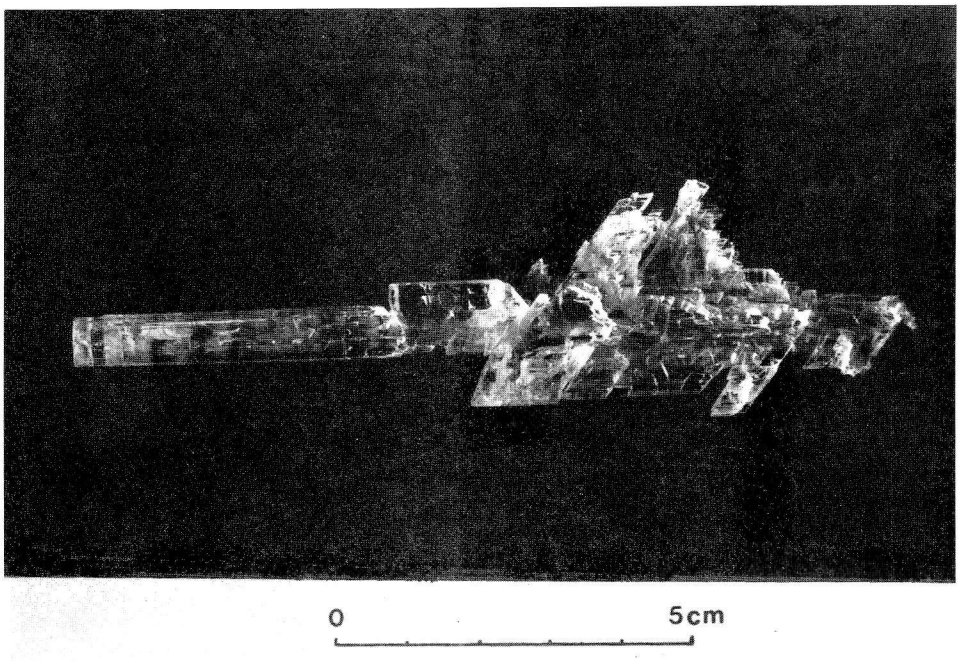

Fig. 2. Big gypsum crystal from Tajna jama cave
Slika 2. Veliki kristal sadre iz Tajne jame

Gypsum is preserved in the dry inner part of the cave only which are no more influenced by the external impacts. As well gypsum is not found close to the percolated water or along the brook and their corrosion was observed even. Obviously the actual cave climate is periodically too humid.

FINDING SITE IN THE CAVE KUBIK

The entrance to the cave Kubik lies in the bottom of dry valley south from Brezovica in Slovenian Istria. There are some swallow holes in the bottom and by one of them one can reach several hundred meters long, almost horizontal water channel. The cave was explored and described by the members of CC Dimnice from Koper (F. MALEČKAR, 1978).

The cave Kubik is one of very rare caves developed in flysch rocks. The entrance part, 3 m deep, lies in carbonate turbidites, the horizontal part of the cave developed in marls. Marls and sandstones overlay the limestone bed which is about 2 m thick.

The cave opened when the water flowing through the net of initial channels on the contact between limestone and marl augmented it erosional power and incised into the marl bed beneath. Thus the actual cave developed and the

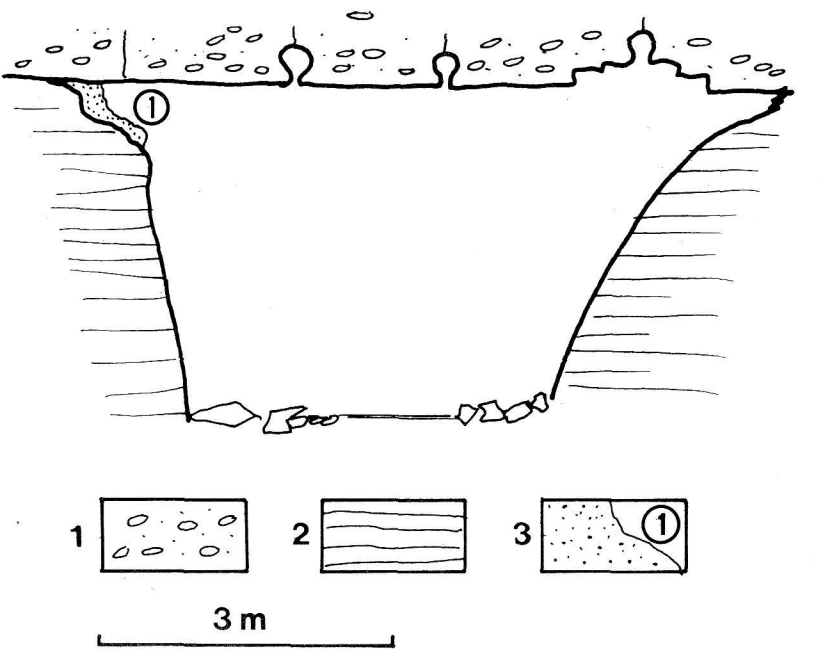

Fig. 3. Cross section of the passage in the cave Kubik
Slika 3. Profil rova v jami Kubik
Legend: 1. nummulitic limestone, carbonate part of turbidite series, 2. flysch marl, 3. weathered marl where the gypsum crystals are found
Legenda: 1. numilitni apnenec, karbonatni del turbiditne serije, 2. flišni lapor, 3. prepereli lapor v katerem se nahajajo kristali sadre

initial channels on the roof remained as marls above the limestone are impermeable.

Gypsum is found in the cave on weathered marl on the contact of upper limestone bed and underlain marl. Gypsum crystals are up to 3 cm big, transparent and show the tendance to grow in a limited place. They are deposited in weathered marls below the passage roof which are not reached by the flood waters. The gypsum was thus precipitated from the solutions entering the channel between the limestone and marl beds, the water and dissolved gypsum originated from the limestone. As this limestone belongs to flysch sequence which does not contain evaporite rocks and thus the possible gypsum origin in these rocks could be by pirite oxidation which is proved in flysch (M. PLENIČAR et a., 1973).

By pirite oxidation the sulphuric acid appears and thus could be explained the origin of dense nets along the sheeting fissures of the initial channels in the limestone bed in some caves in flysch (A. MIHEVC, 1991), the first phase of initial channels on limestone respectively.

CONCLUSION

Described gypsum finding sites in Tajna jama and in Kubik have some common properties although they developed in different conditions.

Fig. 4. A characteristic part of the channel in the cave Kubik
Slika 4. Značilni rov v jami Kubik

Dry cave climate and absence of vertical percolation are common. In Tajna jama the reason lies in uncrushed limestone with almost vertical beds, in the cave Kubik the reason are impermeable marls and sandstones which overlay the cave. The gypsum is in both cases deposited in the sediment which is preserved in upper parts of the cave passage. The gypsum grows in form of crystals, and in Tajna jama in form of blossoms on the walls of the passage.

According to all signs the gypsum takes its origin in the near rocks where the pirite oxidation probable occurs. Sulfate ions come from the source into the cave passage in the form of solution. Where the inflow of this solution is covered by the sediment beacuse of evaporation bigger or smaller crystals occur, where it comes through the pores in the rock the gypsum occurs in a form of blossoms.

The occurrence of gypsum in the altitude of the initial channels in the both caves and the probable origin of gypsum from pirite shows an obvious importance of sulfide oxidation by creating the initial channels in karst. These channels are later transformed by percolating or sinking water in virtual karst conduits.

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SADRA V TAJNI JAMI IN JAMI KUBIK

Povzetek

Opisani nahajališči sadre v Tajni jami in jami Kubik imata nekatere skupne značilnosti, čeprav sta nastali v zelo različnih pogojih.

Skupna jima je suha jamska klima ter odsotnost vertikalnega prenikanja. V Tajni jami je vzrok temu nepretrt apnenec s skoraj vodoravnimi plastmi, v jami Kubik pa neprepustni laporji in peščenjaki, ki leže nad jamo. Sadra se v

obeh primerih nahaja v sedimentu, ki je ohranjen v gornjih delih jamskega rova. Sadra raste v obliki monokristalov, v Tajni jami pa tudi v obliki cvetov na stenah rova.

$CaSO_4$ izvira po vseh znakih sodeč iz okoliške kamnine, kjer prihaja verjetno do oksidacije pirita. Sulfatni ioni prihajajo v jamski rov v obliki raztopine. V jamskih klastičnih sedimentih kristale iz rastopine veliki kristali, kjer pa prihaja raztopina skozi pore v steni rova pa v obliki cvetov.

Pojav sadre v višini inicialnih kanalov obeh jam pa kaže na pomeno oksidacije sulfidov pri tvorjenju inicialnih kanalov v krasu. Te kanale je kasneje preoblikovala prenikajoča ali ponikajoča voda v prave kraške prevodnike.