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DEPOSITIONAL ENVIRONMENT OF SECONDARY PHOSPHATE MINERALS IN MĂGURICI CAVE (ROMANIA)

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The Măgurici Cave is located in northwestern Romania, approximately 100 km north of the town of Cluj, in the north central part of the Someş Plateau. The floor of the Entrance Passage comprises boulders and rubble fallen from the roof and walls. Throughout the rest of the cave the floor comprises argillaceous sediments of unknown thickness. The main guano deposits are at the far end of the cave, reached through several tight clefts and low passages. Isolated bat colonies have formed small guano deposits along the Bat Gallery and Clay Passage. Dry powdery guano covers the cave floor, limestone blocks and parts of the walls except in the Guano Gallery, where most of the organic sediment is fresh and damp. Throughout the sampled part of the cave, the relative humidity ranges from 85 and 100% while the mean temperature remains constant year-round in the range of 9-10.2 °C (Borda, pers. comm.). A temperature increase (in average with 5–6 °C higher) was measured within both fresh and fossil guano deposits.

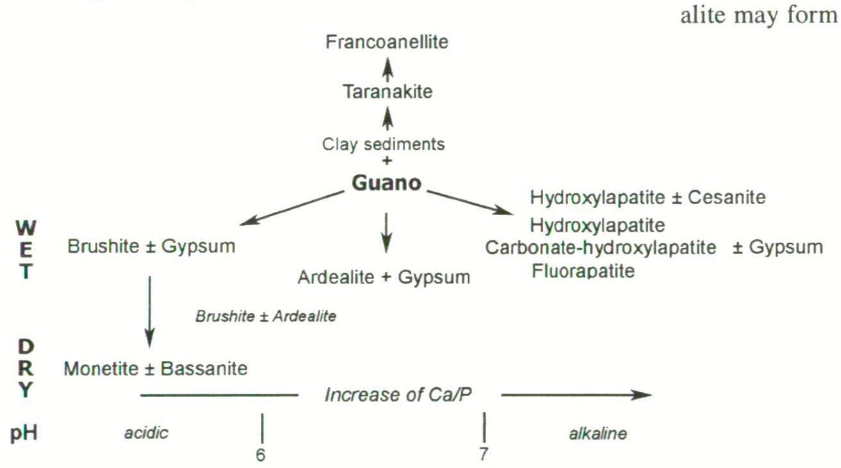

Fig. 1: Mineral paragenesis sequences in Măgurici Cave.

The mineral assemblages investigated in Măgurici Cave are diverse. The phosphatization of argillaceous sediments and limestone leads to the generation of a complex suite of phosphate minerals. Two tendencies were observed: (a) in the presence of excess alkali, the mineral formed initially is taranakite, which partially dehydrates to francoanellite due to a decrease in the water vapour partial pressure (phenomenon restricted to certain locations within the cave), and (b) a sequence of Ca-rich phosphate minerals formed when guano reacts with limestone bedrock or fallen blocks. In the second situation, four main mineral assemblages were documented (Fig. 1). We interpreted their precipitation as a response to changes in the pH and relative humidity of the environment, along with a progressive increase of the Ca/P ratio (Fig. 1). In addition, an interesting observation is that all Ca-rich phosphate minerals appear in paragenesis with different sulphates, each of them strengthens the physico-chemical conditions of the depositional environment.

The coexistence of the described minerals within the phosphate aureole gives information about genetic environments. Brushite and taranakite form under damp conditions from solution with a pH lower than 6. Partial or total dehydration under the same acidic pH results in the precipitation of francoanellite and monetite, respectively. Although ardealite may form over a wide range of relative humidity values, its field of nucleation lies between pH 6.2 and 7. The presence of hydroxylapatite indicates a slightly alkaline environment, which precipi-tates and is stable under such conditions (POSNER *et al.*, 1984). Its abundance when comparing to the other phosphates in this cave clearly suggests that the depositional environment throughout much of the cave extent is slightly alkaline, being acidic or neutral only in the vicinity of guano accumulations.

In addition, the present study presents the second worldwide reported occurrence of *phosphammite* discovered in a cave environment. This rare mineral occurs as small transparent crystals within the guano deposit, precipitated in an early stage from the liquid fraction of guano.

Reference

POSNER, A. S., BLUMENTHAL, N. C. & BETTS, F. (1984). Chemistry and structure of precipitated hydroxylapatites. *in* Nriagu, J. O. & Moore, P. B. (Eds.): Phosphate minerals, Springer-Verlag, Berlin, 330-350.