

## CAVE MINERALOGY AND STABLE ISOTOPE GEOCHEMISTRY OF LILIECILOR CAVE, ROMANIA

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The karst of the Trascău Mts. (E Apuseni Mts., Romania) although extensive both at surface and underground, has received little attention from scientists so far. From a mineralogical point of view, the prospect of discovering rare cave minerals in this region is dim, due to its monotonous lithology and absence of overlying or adjacent ore deposits. However, applying stable isotope analysis to various cave minerals as carbonates, phosphates, or sulphates, could significantly advance the present understanding of the cave depositional environment at times when the mineral assemblages were precipitated.

Although the number of minerals discovered in the Liliecilor Cave is limited, the thick guano deposit (up to 2 m) covers most of the floor; it attracts scientific interest. The cave consists of a 113 m long, linear passage, with an elliptical cross-section, few short side passages, and no speleothems. Analytical methods, used in this study include powder X-ray diffraction (partly evaluated by Rietveld refinements), micro X-ray fluorescence, and isotope ratio mass spectrometry ( $\delta^{34}\text{S}$  and  $\delta^{18}\text{O}$  in sulphates and  $\delta^{18}\text{O}$  in phosphates).

Based on the phosphate paragenesis in the Liliecilor Cave it appears that parts of the "ideal" sequence of phosphate deposition (HILL & FORTI, 1997) are repeated over and over from top to bedrock. All the re-

quired cations ( $\text{Ca}^{2+}$ ,  $\text{Na}^{1+}$ ,  $\text{Al}^{3+}$ ,  $\text{Mg}^{2+}$ , and  $\text{Fe}^{2+,3+}$ ) are available throughout the guano deposit that contains isolated limestone fragments and clay lenses. Consequently, the controlling factors for the precipitating species must be the pH and the humidity of the deposit. The succession of phosphate minerals indicates that leaching from the uppermost, fresh layer of bat guano must follow both vertical and horizontal gradients, with impervious layers hindering its dispersion at times. Percolating solutions are rich in guano-derived phosphate and sulphate; based on  $\delta^{34}\text{S}$  values of gypsum from the cave, the dissolved  $(\text{SO}_4)^{2-}$  is probably brought about by the oxidation of limestone-associated sulphides. The chemistry of leachates varies throughout the sediment pile due to the latter's compositional differences or as a result of alterations generated by precipitating species. Further changes in sediment pH and humidity (due, for example, to changes in the chemistry of the percolating solutions) may induce phase transformations to minerals that are more stable under these newly created conditions.

### Reference

HILL, C.A. & FORTI, P., (1997): Cave minerals of the world, 2<sup>nd</sup> Ed. National Speleological Society, Huntsville.