

Re-examination of berlinite (AlPO₄) from the Cioclovina Cave, Romania

BOGDAN P. ONAC^{1,2,*} AND HERTA S. EFFENBERGER³

¹Department of Geology, University of South Florida, 4202 E. Fowler Avenue, SCA 528, Tampa, Florida 33620, U.S.A.

²Department of Mineralogy, Babeş-Bolyai University/Speleological Institute, Clinicilor 5, 400006 Cluj, Romania

³Institut für Mineralogie und Kristallographie, Universität Wien, Althanstrasse 14, A-1090 Wien, Austria

ABSTRACT

Berlinite is a mineral indicative of high-temperature formation and, therefore, it would not be expected to be present in a sedimentary environment. In this study, we review the characteristics of a berlinite-bearing deposit and present a single-crystal structure investigation based on X-ray data: the refinement converged at $R1(F) = 0.0276$, $wR2(F^2) = 0.0657$ for 677 reflections ($2\theta_{\text{MoK}\alpha} \leq 70^\circ$) and 31 variables in space-group $P3_121$ [$a = 4.9458(10)$, $c = 10.9526(20)$ Å, $V = 232.0$ Å³, $Z = 3$ {AlPO₄}]. The average $\langle T-O \rangle$ bond distances within the two crystallographically unique TO₄ tetrahedra are 1.734 and 1.526 Å, respectively. From the scattering power at these T sites and the stereochemistry, the presence of an AlO₄ tetrahedron linked to a PO₄ tetrahedron is established. Consequently, the sample from Cioclovina Cave is verified as AlPO₄ (modification berlinite), reconfirming the first description of this mineral from a sedimentary occurrence, which underwent an obvious natural heating process.

Keywords: Berlinite, Cioclovina Cave, Romania, cave minerals