Ángelaite $Cu_2AgPbBiS_4$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As subhedral, commonly oriented inclusions in galena to 200 μm.

Physical Properties: *Cleavage*: None observed. *Tenacity*: Brittle. *Fracture*: Uneven. VHN = 245- 263, 253 average (10 g load). Hardness = 3.5 D(meas.) = n.d. D(calc.) = 6.89

Optical Properties: Opaque. *Color*: Gray with a brownish tint, lacks internal reflections. *Streak*: Dark gray. *Luster*: Metallic.
Optical Class: *Bireflectance*: Strong. *Pleochroism*: Strong, light gray with a brownish tint to light cream with a greenish tint. A*nisotropism*: Strong, in shades of pale grey, deep green, and deep blue. R_1-R_2: (470) 40.2-45.7 (23.8-26.4)$_{oil}$, (546) 39.3-44.5 (23.2-25.9)$_{oil}$, (589) 38.9-44.1 (23.1-25.7)$_{oil}$, (650) 38.6-44.1 (23.0-25.8)$_{oil}$

Cell Data: *Space Group*: *Pnma*. a = 12.734(5) b = 4.032(1) c = 14.633(5) Z = 4

X-ray Powder Pattern: Ángela mine, Los Manantiales mining district, Chubut Province, Argentina. 3.66 (100), 3.02 (100), 2.646 (60), 3.11 (50), 2.011 (40), 3.31 (30), 3.50 (20)

Chemistry:

	(1)	(2)
Cu	16.7(3)	16.31
Ag	13.4(2)	13.84
Pb	27.8(6)	26.58
Bi	26.6(5)	26.81
S	16.0(2)	16.45
Total	100.5(5)	100.00

(1) Ángela mine, Los Manantiales mining district, Chubut Province, Argentina; by electron microprobe analysis; corresponding to $Cu_{2.07}Ag_{0.97}Pb_{1.05}Bi_{1.00}S_{3.91}$. (2) $Cu_2AgPbBiS_4$.

Occurrence A hypogene mineral in polymetallic Au- and Ag-bearing veins. Probably part of an exsolution assemblage from originally copper-silver-bismuth-rich galena.

Association: Pyrite, sphalerite, chalcopyrite, hematite, native gold, galena, aikinite, wittichenite, miharaite, cervelleite.

Distribution: At the Ángela veins, Los Manantiales mining district, Chubut Province, Argentina.

Name: For the group of mineralized veins from which the first specimens were collected.

Type Material: Systematic Mineralogical Collection, Department of Materials Research and Physics, Division of Applied Mineralogy, University of Salzburg, Austria (14934).

References: (1) Topa, D., W.H. Paar, H. Putz, G. Zagler, M.K. de Brodtkorb, C.J. Stanley, A.C. Roberts, and E. Makovicky (2010) Mineralogical data on angelaite, $Cu_2AgPbBiS_4$, from the Los Manantiales District, Chubut, Argentina. Can. Mineral., 48(1), 139-144. (2) Brodtkorb, M.K. de and W.H. Paar (2004) Angelaíta, en la paragénesis del distrito Los Manantiales, provincia de Chubut: una nueva especie mineral. Rev. Asoc. Geol. Argentina, 59, 787-789. (3) Topa, D., E. Makovicky, and H. Putz (2010) The crystal structure of angelaite, $Cu_2AgPbBiS_4$. Can. Mineral., 48(1), 145-153. (4) Williams, P.A., F. Hatert, M. Pasero, and S.J. Mills (2010) IMA Commission on New Minerals, Nomenclature and Classification (CNMNC) Newsletter 6, New minerals and nomenclature modifications approved in 2010. Mineral. Mag., 74(6), 942.