Baumstarkite $Ag_3Sb_3S_6$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. Equant to prismatic crystals, to 3 mm, display {001}, {101}, {201}, {010}, {011}, and {100}. *Twinning*: Common, on [001].

Physical Properties: *Cleavage*: Perfect on {001}, less perfect on {100}. *Fracture*: Even. *Tenacity*: Sectile, somewhat flexible. Hardness = ~2.5 VHN = 46-98 (25 g load). D(meas.) = 5.33 D(calc.) = 5.39

Optical Properties: Opaque, transparent on thin edges. *Color*: Iron-black, grayish black on fresh surfaces; deep blood-red in transmitted light, may show red internal reflections; gray to white in reflected light. *Streak*: Grayish red to grayish black. *Luster*: Metallic.
Optical Class: *Anisotropism*: Strong, bright white to gray with a brownish tint to very dark blue; dull greenish yellow to brown to mauve to dark blue on twinned grains. *Bireflectance*: Weak to moderate; light bluish gray to light brownish white.
R_1-R_2: (400) 33.2-41.0, (420) 32.7-40.8, (440) 32.2-40.2, (460) 31.6-39.6, (480) 31.1-39.5, (500) 30.4-38.8, (520) 30.0-38.1, (540) 29.4-37.4, (560) 28.6-36.8, (580) 28.1-36.4, (600) 27.6-35.7, (620) 27.0-34.6, (640) 26.4-33.6, (660) 25.9-32.7, (680) 25.4-32.4, (700) 25.2-31.3

Cell Data: *Space Group*: $P\bar{1}$. a = 7.766(2) b = 8.322(2) c = 8.814(2) α = 100.62(2)° β = 104.03(2)° γ = 90.22(2)° Z = 2

X-ray Powder Pattern: San Genaro mine, Peru; similar to aramayoite.
2.798 (100), 3.425 (8), 2.841 (8), 3.224 (6), 1.3994 (6), 2.013 (5), 1.971 (5)

Chemistry:

	(1)	(2)	(3)
Ag	36.3	38.4	36.72
As	0.7	6.7	
Sb	40.2	30.8	41.45
S	22.0	22.9	21.83
Total	99.4	99.5	100.00

(1) San Genaro mine, Peru; by electron microprobe, average of 22 analyses; corresponding to $Ag_{2.97}(Sb_{2.91}As_{0.09})_{\Sigma=3.00}S_{6.03}$. (2) Koryu mine, Hokkaido, Japan; electron microprobe analysis, corresponds to $Ag_{3.00}(Sb_{2.14}As_{0.84})_{\Sigma=2.98}S_{6.02}$. (3) $Ag_3Sb_3S_6$.

Polymorphism & Series: Trimorphous with cuboargyrite and miargyrite.

Occurrence: Of hydrothermal hypogene origin coating miargyrite (Peru); in an epithermal gold-silver quartz vein cutting black mudstone (Japan).

Association: Miargyrite, pyrargyrite, stannite, kesterite, andorite, diaphorite, robinsonite, galena, chalcopyrite, sphalerite, pyrite (Peru); pyrargyrite-proustite, miargyrite (Japan).

Distribution: From the San Genaro mine, Huancavelica Department, Peru [TL]; from the 60 m level of the No. 3 vein, Koryu mine, Hokkaido, Japan.

Name: Honors Manfred *Baumstark* (b. 1954), German mineralogist, who provided the type material.

Type Material: Mineralogical Institute, University of Salzburg, Salzburg, Austria (14524 and 14525); The Natural History Museum, London, England (2000,32 and 2000,33).

References: (1) Effenberger, H., W.H. Paar, D. Topa, A.J. Criddle, and M. Fleck (2002) The new mineral baumstarkite and a structural reinvestigation of aramayoite and miargyrite. Amer. Mineral., 87, 753-764. (2) Kitakaze, A., H. Itoh, R. Komatsu, and Y. Higuchi (2012) Baumstarkite from the Koryu mine, Hokkaido, Japan. Can. Mineral., 50, 101-109.