

Chalcoalumite

$\text{CuAl}_4(\text{SO}_4)(\text{OH})_{12} \cdot 3\text{H}_2\text{O}$

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Crystal Data: Monoclinic. *Point Group:* 2. As thin tabular enantiomorphous crystals with {100} exhibiting an equilateral triangular outline, to 0.5 mm; as spherical crystal aggregates; most commonly as fibrous to massive botryoidal crusts. *Twinning:* Typically twinned on {100} yielding composites that closely resemble thick untwinned individuals. Twinning on {010} forms diamond-shaped tablets. Twinning on {13 $\bar{6}$ } produces a swallowtail composite with deep reentrant, or fourlings and eightlings. Diamond-shaped eightlings combining all three twin laws have been noted.

Physical Properties: *Cleavage:* On {100}, perfect. *Tenacity:* Sectile. Hardness = 2.5 D(meas.) = 2.29 D(calc.) = 2.25

Optical Properties: Transparent to translucent. *Color:* Turquoise-green to Nile blue, pale gray to nearly colorless; in transmitted light, colorless. *Streak:* White. *Luster:* Vitreous to dull. *Optical Class:* Biaxial (+). *Pleochroism:* Weak; X = pale green; Y = colorless; Z = robin's-egg-blue. *Orientation:* Y = b; Z $\wedge$ c = 22°. *Dispersion:* r < v, strong. $\alpha = 1.523$ $\beta = 1.525$ $\gamma = 1.532$ 2V(meas.) = Small.

Cell Data: *Space Group:* $P2_1$. a = 17.090 b = 8.915 c = 10.221 $\beta = 95^\circ 53'$ Z = 4

X-ray Powder Pattern: Bisbee, Arizona, USA.
8.502 (100), 4.250 (91), 4.178 (23), 7.898 (22), 4.786 (22), 5.100 (13), 2.520 (11)

Chemistry:	(1)	(2)
SO ₃	14.67	15.23
Al ₂ O ₃	38.88	38.80
CuO	14.56	15.13
H ₂ O	30.60	30.84
insol.	0.28	
Total	98.99	100.00

(1) Bisbee, Arizona, USA. (2) $\text{CuAl}_4(\text{SO}_4)(\text{OH})_{12} \cdot 3\text{H}_2\text{O}$.

Occurrence: A rare secondary mineral in the oxidized portions of copper deposits.

Association: Cuprite, malachite, azurite, goethite (Bisbee, Arizona, USA); mbobomkulite, hydrombobomkulite (Mbobokulu Cave, South Africa).

Distribution: In the USA, from Bisbee, Cochise Co., and in the Grandview mine, Grand Canyon, Coconino Co., Arizona; at the Titusville mine, head of Kendall Gulch, San Juan Co., Colorado; and in the Lovelock mine, Table Mountain district, Churchill Co., Nevada. On the Spatsum claim, south of Ashcroft Manor, British Columbia, Canada. From the Britannia mine, Snowdonia, Gwynedd, Wales. In England, at South Wheal Crebor, Tavistock, Devon, and in the Penberthy Croft mine, St. Hilary, Cornwall. At Ottré, near Salmchâteau, Belgium. From L'ubietová, near Banská Bystrica (Libethen, near Neusohl), Slovakia. At the Baccu Locci mine, near Villaputzu, Sarrabus district, Sardinia, Italy. From the Sjö mine, near Grythyttan, Örebro, Sweden. In the Mbobokulu Cave, near Ngodwana, Eastern Transvaal, South Africa.

Name: For essential chemical components, from the Greek *chalkos*, for *copper* and Latin *alum*, for *aluminum sulfate*.

Type Material: Harvard University, Cambridge, Massachusetts, 87005-87008; The Natural History Museum, London, England, 1961,27; National Museum of Natural History, Washington, D.C., USA, 95226, R6326.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 580-581. (2) Williams, S.A. and B. Khin (1971) Chalcoalumite from Bisbee, Arizona. Mineral. Record, 2, 126-127.

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