

Mineral Showcase

Chalcanthite



Chalcanthite, from the Greek words *chalkos* (brass or copper) and *anthos* (flower), is a relatively rare secondary mineral found in the hydrothermal oxidation zone of copper deposits associated with numerous other copper-iron sulfates. In most settings the mineral is a minor ore of copper, except at Chuquicamata, Chile, where it serves as an important ore. Otherwise, it is found sparingly in many copper deposits throughout the southwest US.

Specimens range from a pale sky blue to deep royal blue, even greenish when grading into melanterite, which it often does. Well developed crystals are extremely rare in nature. When crystals do form, they are generally short prismatic or tabular in habit. Much more likely to form are the cross-fiber veinlets reminiscent of satin spar gypsum, or the upright curved aggregates called Ram's Horn. More often that not, however, chalcanthite forms as botryoidal or stalactitic masses encrusting the mine's walls and structural timbers as a precipitant from solutions produced from the exposure of wet sulfide ores.

Copper sulfate, in itself, is not a rare compound in nature. However, because chalcanthite is so soluble in water, the mineral only occurs in arid regions, and only in portions of a mine protected from the outside elements. Deposits containing primary copper-iron sulfides, mainly chalcopyrite and pyrite, that are subjected to alteration in acidic near-surface environments will present opportunity for the mineral to form and persist. Rainwater percolates through overlying formations, becoming charged with various anions that turn the water into an effective dissolving agent. When the solution contacts deposits containing sulfides, sulfuric acid—a very strong and insidious chemical—will result. Sulfate salts, such as chalcanthite, are the first to form. In such settings enriched with sulfuric acid, chemical reactions usually continue until less soluble minerals form as the acid reacts with, and recombines, elements and compounds derived from the host rocks and mineral deposit.

Thus, one would not expect to find chalcanthite in carbonate formations, such as limestones and dolomites, as copper carbonates would form at the expense of the far more readily soluble sulfate. Likewise, copper silicates will form in environments deprived of carbon dioxide, but rich in silicate minerals derived from, for example, shales.

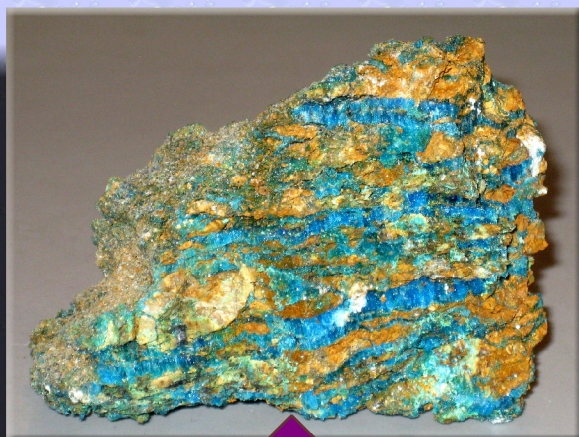
Chalcanthite is a soft (2.5), vitreous, translucent mineral with an indiscernible cleavage and conchoidal fracture (difficult to actually observe on natural specimens). Mines containing the mineral invariably have a distinctive odor of sulfur dioxide, indicative of the excessive amount of sulfuric acid available to form such salts.

On that note, chalcanthite is easily identified by its sweetish, astringent, metallic taste. One quickly learns to recognize this distinctive characteristic, as the sulfur-rich environment quickly imposes itself on the nostrils and saliva of intruders. While hydrous copper sulfate is a poisonous compound, it is not *deadly*, as virtually *all* references lead one to believe. A simple taste test to identify the mineral will do no harm! On more than one occasion I have accidentally been rewarded with a mouthful of the compound when a careless strike with a hammer set loose a barrage of dust. Unpleasant, to be sure, but hardly the end of the world!

As a consequence of the environment that it forms in, chalcanthite almost always contains appreciable amounts of iron, which makes the mineral highly unstable outside of the environment in which it formed. For this reason, chalcanthite is difficult to maintain in collections. Artificial environments must not be too humid, else the mineral will dissolve, nor too dry, whence valuable specimens will desiccate and crumble to a worthless pale blue powder.

I have had much success displaying specimens in air tight containers. It seems that the most stable samples are those with a very low iron content. Other specimens are amenable to a lacquer protectant, such as hair spray. However, take caution to test a small piece first, as the lacquer often causes discoloration, ruining the specimen.

It should be noted that the large aggregates of beautifully crystallized specimens passed off as *chalcanthite* are, in fact, artificially produced in a laboratory setting. Such specimens are useful in collections that serve to demonstrate the various crystal classes, but should be properly identified by the chemical name *hydrous copper sulfate*. Buyer beware!



X 109 D

*Satin spar-like cross-fiber veinlets
in corroded Anthophyllite.*

Antler Mine

Kingman, AZ

3.1 x 2.4 x 1.8 inches



X 110 D

*Solid cross-fiber aggregate of prismatic
crystals without matrix.*

Antler Mine

Kingman, AZ

1.58 x 1.25 x .5 inches



X 108 D

*Roughly prismatic crystals
embedded in cuprian Melanterite.*

Antler Mine

Kingman, AZ

1.75 x 1.58 inches



X 38 D

*Drusy crystal aggregate
on granitic matrix.*

Antler Mine

Kingman, AZ

1.25 x 1.25 inches

All specimens from the G. Miles Lehman Collection

Tests: gives copper globule when fused in a sodium carbonate flux on charcoal. Soluble in water, producing blue solution. Dilute hydrochloric acid solution with barium chloride added yields a precipitate of barium sulfate (sulfate test). Infusible, but turns white and yields much water in closed tube. Sweetish metallic, astringent taste. Perform this test sparingly, as it is poisonous.

CuO = 31.8 percent SO₃ = 32.1 percent H₂O = 36.1 percent



X 106 D

*"Ram's Horn" crystals with mixed sulfates
on corroded Anthophyllite matrix*

Antler Mine

Kingman, AZ

Specimen 1.58 x 1.125

Crystals about .75 inches

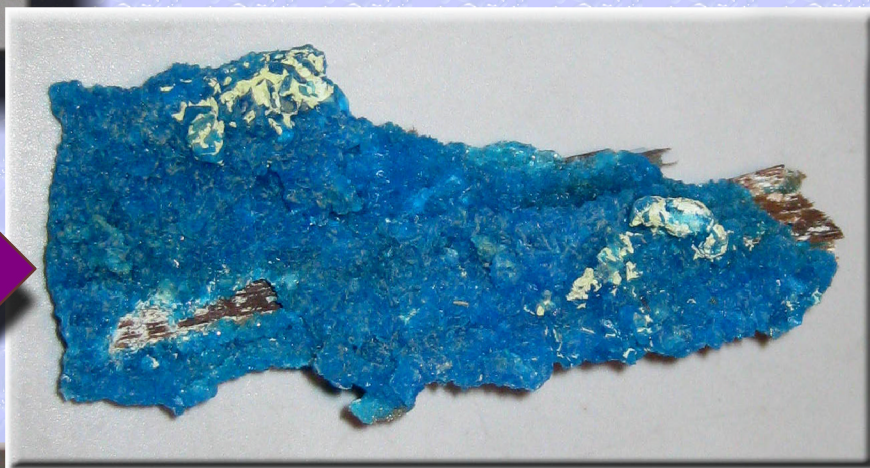
X 46 D

*Drusy aggregate of minute
crystals on mine timber.*

Antler Mine

Kingman, AZ

Specimen 1 x 2.75 inches



X 40 D

*Efflorescence of Bonatite
after Chalcantite*

Dewey Mine

Clark Mountains

San Bernardino Co., CA

Specimen 3 x 1.75 inches

X 44 C

*Granular aggregates of Chalcantite
grading into Pisanite.*

Antler Mine

Kingman, AZ

Specimen 3.5 x 2 x 1.5 inches



All specimens from the G. Miles Lehman Collection

Classic Relationship Specimen



Specimen X 113 D

Prismatic “Ram’s Horn” crystals on matrix.

Specimen 1.125 x 1 inches

Crystals about .75 inches

Chalcantite is a difficult mineral to satisfactorily display in collections, as it is very sensitive to atmospheric conditions. Even in mines where chalcantite forms in the near-surface oxidation zone, it is quite rare to find a specimen unaffected by unpredictably changing conditions. This specimen is dehydrating to bonatite, and may eventually crumble to a powder if not kept in an air-tight container. Specimens with little to no iron impurity survive better outside their native environments.

from the **G. Miles Lehman Collection**