Azurite $Cu_3(CO_3)_2(OH)_2$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals are typically complex, with over 100 forms recorded, to 30 cm. Tabular on {001}, less commonly so on {102} or {$\overline{1}$02}; short to long prismatic along [001], with prominent {110} and {100}, or along [010], with wedgelike terminations. As rhomboidal, lenticular, or spherical subparallel aggregates, which may form rosettes; also as internally radial stalactitic or columnar aggregates; botryoidal, drusy, earthy, massive. *Twinning:* Rare; twin planes {$\overline{1}$01}, {$\overline{1}$02}, {001}.

Physical Properties: *Cleavage:* On {011}, perfect but interrupted; on {100}, fair; on {110}, poor. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 3.5–4 D(meas.) = 3.773(3) D(calc.) = 3.78

Optical Properties: Transparent to translucent. *Color:* Azure-blue, Berlin blue, very dark to pale blue; pale blue in transmitted light. *Streak:* Pale blue. *Luster:* Vitreous to subadamantine.
Optical Class: Biaxial (+). *Pleochroism:* In shades of blue. *Orientation:* $X = b$; $Z \wedge c = -12°36'$. *Dispersion:* $r > v$, strong. *Absorption:* $Z > Y > X$. $\alpha = 1.730$ $\beta = 1.754$–1.758 $\gamma = 1.835$–1.838 2V(meas.) = 67°

Cell Data: *Space Group:* $P2_1/c$. $a = 5.0109(5)$ $b = 5.8485(6)$ $c = 10.345(2)$ $\beta = 92.43(3)°$ Z = 2

X-ray Powder Pattern: Tsumeb, Namibia.
3.516 (100), 2.224 (70), 5.15 (55), 3.674 (50), 2.510 (35), 2.287 (35), 5.08 (30)

Chemistry:

	(1)	(2)
CO_3	25.46	25.54
CuO	69.08	69.23
H_2O	5.46	5.23
Total	100.00	100.00

(1) Chessy, France. (2) $Cu_3(CO_3)_2(OH)_2$.

Occurrence: In the oxidized zones of copper deposits associated with carbonate rocks; may constitute an ore of copper.

Association: Malachite, chrysocolla, brochantite, antlerite, cuprite, cerussite, smithsonite, calcite, dolomite.

Distribution: Widespread, with many localities producing good crystals. From Chessy, near Lyon, Rhône, France. At Alghero and elsewhere on Sardinia, Italy. In the Zmeinogorsk (Schlangenberg) and Zolotuskinskii mines, Altai Mountains, Russia. Large crystals at the Touissit mine, near Oujda, Morocco. An ore at the Chingola mine, Nchanga, Zambia. Extraordinary examples from Tsumeb, Namibia. In the USA, in Arizona, fine examples from the Copper Queen and other mines of the Warren district, Bisbee, Cochise Co.; at Morenci, Greenlee Co.; in the Mammoth-St. Anthony mine, Pinal Co.; from the New Cornelia mine, Ajo, Pima Co.; at the Kelly and Graphic mines, Magdalena, Socorro Co., New Mexico; in Utah, in the Apex mine, St. George, Washington Co., and at the Big Indian mine, near La Sal, San Juan Co. Fine crystals from the El Cobre mine, Concepcion del Oro, and at the San Carlos mine, Mazapil, Zacetecas, Mexico. In Australia, many localities, as in New South Wales, at Broken Hill, also fine crystals from the Girilambone mine, north of Nyngan. In China, from the Yang Chweng mine, Shilu, Guangdong Province, China.

Name: From the Persian *lazhward*, for its characteristic blue color.

Type Material: Natural History Museum, Paris, France, 103.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 264–269. (2) Gattow, G. and J. Zemann (1958) Neubestimmung der Kristallstruktur von Azurit, $Cu_3(OH)_2(CO_3)_2$. Acta Cryst., 11, 866–872 (in German). (3) (1960) NBS Circ. 539, 10, 30. (4) Dana, E.S. (1883) Dana's system of mineralogy, (5th edition), 715–716.