

Wroewolfeite **$\text{Cu}_4(\text{SO}_4)(\text{OH})_6 \cdot 2\text{H}_2\text{O}$**

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Crystal Data: Monoclinic. *Point Group:* *m*. Lathlike crystals, to 1 mm. *Twinning:* By reflection on {001} and {100}, yielding fourlings.

Physical Properties: *Cleavage:* Perfect on {010}, {100}, {001}. Hardness = ~ 2.5
D(meas.) = 3.27(1) D(calc.) = 3.30

Optical Properties: Translucent. *Color:* Dark greenish blue; blue in transmitted light.
Streak: Pale blue. *Luster:* Vitreous.
Optical Class: Biaxial (-). *Pleochroism:* Strong; X = pale blue; Y = deep greenish blue; Z = greenish blue. *Absorption:* $Y \gg Z > X$. $\alpha = 1.637(2)$ $\beta = 1.682(2)$ $\gamma = 1.694(2)$
 $2V(\text{meas.}) = 53^\circ$

Cell Data: *Space Group:* *Pm*. $a = 6.045(1)$ $b = 5.646(1)$ $c = 14.337(6)$ $\beta = 93.39(1)^\circ$
Z = 2

X-ray Powder Pattern: Loudville mine, Massachusetts, USA.
7.152 (100), 3.581 (70), 2.628 (35), 2.004 (30), 2.431 (20), 2.379 (20), 2.278 (20)

Chemistry:

	(1)	(2)
SO ₃	16.48	16.40
CuO	64.22	65.16
H ₂ O	[19.30]	18.44
Total	[100.00]	100.00

(1) Loudville mine, Massachusetts, USA; by electron microprobe, H₂O by difference; with (OH)¹⁻ calculated for charge balance and H₂O adjusted for best agreement between measured and calculated densities, then corresponds to Cu_{3.94}(SO₄)_{1.00}(OH)_{5.88}•2.11H₂O.
(2) Cu₄(SO₄)(OH)₆•2H₂O.

Polymorphism & Series: Dimorphous with langite.

Occurrence: An uncommon secondary mineral in the oxidation zone of copper-bearing hydrothermal mineral deposits; may be post-mine or formed in dumps and in slags.

Association: Langite, posnjakite, serpierite, brochantite, linarite, malachite, chalcocite, covellite.

Distribution: In the USA, from the Loudville mine, Southampton, Hampshire Co., Massachusetts. At Cumpas, Sonora, Mexico. In Wales, in the Ladywell mine, Shelve, Shropshire; at the Nantycagl (Eaglebrook) mine, Ceulanymaesmawr, in the Penrhiw mine, Ystumtuen, and the Frongoch mine, Dyfed; from the Drws-y-Coed mine, Llandwrog, Gwynedd. In the West Blackcraig mine, near Newton Stewart, Kirkcudbrightshire, Scotland. In England, from the Silver Gill and Red Gill mines, Carrock Fells, and the Tynebottom mine, near Garrigill, Cumbria; in the Penberthy Croft mine, St. Hilary, and the East Gunnislake mine, Calstock, Cornwall; at Wheal Friendship, Devon. In the Sheeffry mine, near Croagh Patrick, Co. Mayo, Ireland. From the Cap Garonne mine, near le Pradet, Var, France. In the Glücksrad mine, near Oberschulenberg, Harz Mountains, and at Ramsbeck, North Rhine-Westphalia, Germany. From Nandraž, Slovakia. In the Santa Lucia mine, Sardinia, Italy. At the Bastnäs mine, near Riddarhyttan, Västmanland, Sweden.

Name: To honor Professor Caleb Wroe Wolfe (1908–1980), American crystallographer, Boston University, Boston, Massachusetts, USA.

Type Material: Harvard University, Cambridge, Massachusetts, 122277; National Museum of Natural History, Washington, D.C., USA, 127329.

References: (1) Dunn, P.J., R.C. Rouse, and J.A. Nelen (1975) Wroewolfeite, a new copper sulphate hydroxide hydrate. *Mineral. Mag.*, 40, 1–5. (2) (1976) *Amer. Mineral.*, 61, 179 (abs. ref. 1). (3) Hawthorne, F.C. and L.A. Groat (1985) The crystal structure of wroewolfeite, a mineral with [Cu₄(OH)₆(SO₄)(H₂O)] sheets. *Amer. Mineral.*, 70, 1050–1055.

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