Linarite $PbCu(SO_4)(OH)_2$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals are elongated along [010], typically tabular on $\{\overline{1}01\}$ or {001}, with large {110} and well developed [*h*0*l*], with about another 40 forms known, to 8 cm; in crusts and aggregates. *Twinning:* On {100}, common; also on {001}.

Physical Properties: *Cleavage:* On {100}, perfect; on {001}, interrupted. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 2.5 D(meas.) = 5.35 D(calc.) = 5.33

Optical Properties: Transparent to translucent. *Color:* Bright to dark azure-blue; deep blue in transmitted light. *Streak:* Pale blue. *Luster:* Vitreous to subadamantine. *Optical Class:* Biaxial (–). *Pleochroism:* X = pale blue; Y = blue; Z = Prussian blue. *Orientation:* $Z = b$; $X \wedge c \simeq -24°$. *Dispersion:* $r < v$, strong. $\alpha = 1.809$ $\beta = 1.838$ $\gamma = 1.859$ 2V(meas.) = 80°

Cell Data: *Space Group:* $P2_1/m$. a = 9.701(2) $b = 5.650(2)$ $c = 4.690(2)$ $\beta = 102.65(2)°$ Z = 2

X-ray Powder Pattern: Red Gill mine, England.
3.12 (10), 3.53 (7), 1.719 (6b), 4.48 (4), 2.16 (4), 2.09 (4), 2.56 (3)

Chemistry:

	(1)	(2)
SO_3	19.95	19.97
CuO	19.63	19.85
PbO	55.97	55.69
H_2O	4.45	4.49
Total	[100.00]	100.00

(1) Arenas, Italy; recalculated to 100% after deduction of ZnO 0.04% and MgO 0.26%.
(2) $PbCu(SO_4)(OH)_2$.

Occurrence: An uncommon secondary mineral in the oxidized zone of Pb–Cu deposits.

Association: Brochantite, anglesite, caledonite, leadhillite, cerussite, malachite, hemimorphite.

Distribution: In small amounts from many localities, of which only a few are given here. From Linares, Jaén Province, Spain. At Arenas and San Giovanni, Sardinia, Italy. Fine crystals from the Red Gill and other mines, Caldbeck Fells, Cumbria, England. At Leadhills, Lanarkshire, Scotland. Large crystals in the Kisamori mine, Akita Prefecture, Japan. In Australia, from Broken Hill, New South Wales. In the USA, large crystals at the Mammoth-St. Anthony mine, Tiger, Pinal Co., and in the Grand Reef mine, Santa Teresa Mountains, Graham Co., Arizona; from the Blanchard and Mex-Tex mines, near Bingham, Hansonburg district, Socorro Co., New Mexico; in the Tintic district, Juab Co., Utah; at Cerro Gordo, Inyo Co., and on the Blue Bell claims, near Baker, San Bernardino Co., California. Large crystals from Tsumeb, Namibia.

Name: For its occurrence at Linares, Spain.

Type Material: Mining Academy, Freiberg, Germany, 46.527.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 553–555. (2) Effenberger, H. (1987) Crystal structure and chemical formula of schmiederite, $Pb_2Cu_2(OH)_4(SeO_3)(SeO_4)$, with a comparison to linarite, $PbCu(OH)_2(SO_4)$. Mineral. Petrol., 36, 2–12. (3) Berry, L.G. (1951) The unit cell of linarite. Amer. Mineral., 36, 511—512.