Leadhillite $Pb_4(SO_4)(CO_3)_2(OH)_2$

Crystal Data: Monoclinic, pseudorhombohedral. *Point Group:* $2/m$. Crystals, to 13 cm, are thick to thin tabular along [001], may be barrel-shaped, or pseudorhombohedral {101} and {$\bar{1}$42}, with over 40 forms noted; granular, massive. *Twinning:* On {140}, {340}, {1$\bar{4}$0}, very common, giving pseudohexagonal groupings.

Physical Properties: *Cleavage:* {001}, perfect. *Fracture:* Conchoidal. *Tenacity:* Sectile. Hardness = 2.5–3 D(meas.) = 6.55 D(calc.) = 6.57 Decomposed by hot H_2O; may fluoresce pale yellow under UV.

Optical Properties: Transparent to translucent. *Color:* Colorless, white, gray, pale yellow, yellow, yellowish green, pale green, pale bluish green, pale blue, brown; colorless in transmitted light. *Luster:* Resinous to adamantine, pearly on {001}.
Optical Class: Biaxial (–). *Orientation:* $Z = b$; $X \wedge c = -5.5°$. *Dispersion:* $r < v$, strong, horizontal. $\alpha = 1.87(1)$ $\beta = 2.00(1)$ $\gamma = 2.01(1)$ 2V(meas.) = n.d.

Cell Data: *Space Group:* $P2_1/a$. $a = 9.11(2)$ $b = 11.59(3)$ $c = 20.82(4)$ $\beta = 90.46(2)°$ Z = 8

X-ray Powder Pattern: Leadhills, Scotland; nearly identical to susannite. (ICDD 18-705). 3.53 (100), 2.917 (60), 2.605 (50), 1.549 (35), 2.303 (30), 2.099 (30), 2.874 (25)

Chemistry:

	(1)	(2)
SO_3	7.33	7.42
CO_2	8.14	8.16
PbO	82.44	82.75
H_2O	1.68	1.67
Total	99.59	100.00

(1) Granby, Missouri, USA. (2) $Pb_4(SO_4)(CO_3)_2(OH)_2$.

Polymorphism & Series: Trimorphous with macphersonite and susannite.

Occurrence: An uncommon secondary mineral in the oxidation zone of lead deposits.

Association: Cerussite, anglesite, lanarkite, caledonite, linarite (Leadhills, Scotland); cerussite, caledonite, linarite, diaboleite, boleite, wherryite, paralaurionite, brochantite (Mammoth-St. Anthony mine, Arizona, USA).

Distribution: In Scotland, from Leadhills, Lanarkshire, and Wanlockhead, Dumfriesshire; in the Drumruck mine, Kirkcudbrightshire. In England, from Caldbeck Fells, Cumbria; at Penberthy Croft, St. Hilary, and in the Greystone quarry, Levant, Cornwall. From Bleiberg, Carinthia, Austria. In the USA, from the Beer Cellar mine, Granby, Newton Co., Missouri; in the Tintic district, Juab Co., Utah; in Arizona, fine crystals from the Mammoth-St. Anthony mine, Tiger, Pinal Co., in the Rowley mine, near Theba, Maricopa Co., at the Grand Reef mine, Gila Co., and from Bisbee, Cochise Co. In California, at the Blue Bell claims, near Baker, San Bernardino Co.; from the Searchlight district, Clark Co., and in the Chalk Mountain mine, Chalk Mountain district, Churchill Co., Nevada; from Leadville, Lake Co., Colorado. Very large crystals from Tsumeb, Namibia. At Dundas, Tasmania, Australia. A few other localities are known.

Name: For its initially-noted occurrence at Leadhills, Scotland.

Type Material: Natural History Museum, Paris, France.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 295–298. (2) Giuseppetti, G., F. Mazzi, and C. Tadini (1990) The crystal structure of leadhillite, $Pb_4(SO_4)(CO_3)_2(OH)_2$. Neues Jahrb. Mineral., Monatsh., 255–268.