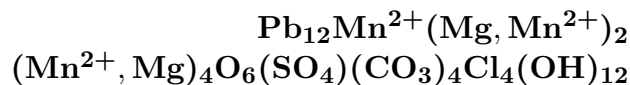


**Philolithite**

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**Crystal Data:** Tetragonal. *Point Group:*  $4/m\ 2/m\ 2/m$ . Crystals are square tabular, {001}, {111}, modified by {110}, {112}, to 0.3 mm; may be aggregated in crusts. *Twinning:* Sectorial in four zones about [001], observed optically.

**Physical Properties:** *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 3–4  
D(meas.) = n.d. D(calc.) = 5.91

**Optical Properties:** Semitransparent. *Color:* Pale to medium apple-green. *Streak:* White.  
*Luster:* Adamantine.

*Optical Class:* Biaxial (+), anomalous. *Pleochroism:* Very weak; pale green to pale yellow-green.  
*Orientation:*  $X \wedge a = 45^\circ$ .  $n = > 1.92$ .  $\omega = \text{n.d.}$   $\epsilon = \text{n.d.}$   $2V(\text{meas.}) = 60^\circ$

**Cell Data:** *Space Group:*  $P4_2/nm$ .  $a = 12.627(9)$   $c = 12.595(9)$   $Z = 2$

**X-ray Powder Pattern:** Långban, Sweden.

2.975 (100), 3.99 (30), 2.752 (30), 8.95 (20), 7.30 (20), 2.473 (20), 1.716 (20)

**Chemistry:**

|                      | (1)    | (2)     |
|----------------------|--------|---------|
| SO <sub>3</sub>      | 1.7    | [2.2]   |
| CO <sub>2</sub>      | [4.9]  | [4.9]   |
| MnO                  | 10.3   | 8.7     |
| PbO                  | 73.7   | 75.9    |
| MgO                  | 1.8    | 2.1     |
| Cl                   | 3.4    | 4.4     |
| H <sub>2</sub> O     | [3.0]  | [3.0]   |
| –O = Cl <sub>2</sub> | 0.8    | 1.0     |
| Total                | [98.0] | [100.2] |

(1) Långban, Sweden; by energy dispersive analysis, presence of (SO<sub>4</sub>)<sup>2-</sup>, (CO<sub>3</sub>)<sup>2-</sup>, (OH)<sup>1-</sup> confirmed by IR; (CO<sub>3</sub>)<sup>2-</sup>, H<sub>2</sub>O calculated from crystal-structure analysis; corresponds to Pb<sub>12.29</sub>(Mn<sub>5.41</sub>Mg<sub>1.66</sub>)<sub>Σ=7.07</sub>O<sub>6.45</sub>(SO<sub>4</sub>)<sub>0.79</sub>(CO<sub>3</sub>)<sub>4.14</sub>Cl<sub>3.57</sub>(OH)<sub>12.40</sub>. (2) Do.; by electron microprobe; (SO<sub>4</sub>)<sup>2-</sup>, (CO<sub>3</sub>)<sup>2-</sup>, H<sub>2</sub>O calculated from crystal-structure analysis; corresponds to Pb<sub>12.32</sub>(Mn<sub>4.45</sub>Mg<sub>1.89</sub>)<sub>Σ=6.34</sub>O<sub>5.31</sub>(SO<sub>4</sub>)<sub>1.00</sub>(CO<sub>3</sub>)<sub>4.04</sub>Cl<sub>4.50</sub>(OH)<sub>12.07</sub>.

**Occurrence:** Very rare in a metamorphosed Fe–Mn orebody.

**Association:** Lead, copper, mendipite, braunite, hausmannite, pyrochroite, manganoan phlogopite, allactite, calcite.

**Distribution:** From Långban, Värmland, Sweden.

**Name:** From the Greek for *loving* and *stone*, in honor of the Friends of Mineralogy organization.

**Type Material:** Swedish Museum of Natural History, Stockholm, Sweden, 37389, 225116; Canadian Museum of Nature, Ottawa, Canada, 58623; Los Angeles Co. Museum, Los Angeles, California, USA, 41794.

**References:** (1) Kampf, A.R., P.B. Moore, E.J. Jonsson, and G.H. Swihart (1998) Philolithite, a new mineral from Långban, Värmland, Sweden. *Mineral. Record*, 29, 201–206. (2) (1999) *Amer. Mineral.*, 84, 686–687 (abs. ref. 1). (3) Moore, P.B., A.R. Kampf, and P.K. Sen Gupta (2000) The crystal structure of philolithite, a trellis-like open framework based on cubic closest-packing of anions. *Amer. Mineral.*, 85, 810–816.