

# Penobsquisite



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**Crystal Data:** Monoclinic. *Point Group:* 2. Euhedral crystals, triangular in outline, tabular on {100}, elongated along [010], to 1.5 mm, showing {100}, {101}, {10 $\bar{1}$ }, {111}, {110}, {1 $\bar{1}$ 0}, {2 $\bar{1}$ 2}, {1 $\bar{1}$ 2}.

**Physical Properties:** *Fracture:* Conchoidal. *Tenacity:* Brittle. *Hardness* = ~3  
D(meas.) = 2.26(3) D(calc.) = 2.27

**Optical Properties:** Transparent to translucent. *Color:* Pale yellow. *Streak:* White.  
*Luster:* Vitreous.

*Optical Class:* Biaxial (+). *Orientation:*  $Y = b$ ;  $Z \wedge c = 16.6^\circ$ .  $\alpha = 1.550(2)$   $\beta = 1.554(2)$   
 $\gamma = 1.592(2)$   $2V(\text{meas.}) = 33(2)^\circ$   $2V(\text{calc.}) = 36.6^\circ$

**Cell Data:** *Space Group:*  $P2_1$ .  $a = 11.620(3)$   $b = 9.407(2)$   $c = 8.726(1)$   $\beta = 98.58(2)^\circ$   
 $Z = 2$

**X-ray Powder Pattern:** Penobsquis mine, Canada.  
7.29 (10), 8.65 (3), 2.113 (3), 5.32 (2), 4.50 (2), 2.958 (2), 2.744 (2)

<b>Chemistry:</b>	(1)
B <sub>2</sub> O <sub>3</sub>	[48.50]
FeO	7.48
MnO	0.23
MgO	1.82
CaO	17.27
Cl	5.77
H <sub>2</sub> O	[19.52]
-O = Cl <sub>2</sub>	1.30
Total	[99.29]

(1) Penobsquis mine, Canada; by electron microprobe, average of three analyses, total Fe as Fe<sup>2+</sup>, total Mn as Mn<sup>2+</sup>, H<sub>2</sub>O confirmed by IR, B<sub>2</sub>O<sub>3</sub> and H<sub>2</sub>O calculated from stoichiometry; corresponding to Ca<sub>1.99</sub>(Fe<sub>0.67</sub>Mg<sub>0.29</sub>Mn<sub>0.02</sub>)<sub>Σ=0.98</sub>B<sub>9</sub>O<sub>12.95</sub>Cl<sub>1.05</sub>(OH)<sub>5.99</sub> • 4.01H<sub>2</sub>O.

**Occurrence:** A very rare residual mineral, obtained by dissolution of halite in a drillcore through a marine evaporite series.

**Association:** Halite, sellaite, fluorite, boracite, hilgardite, pringleite, trembathite, brianroulstonite, hematite, malachite.

**Distribution:** From the Penobsquis evaporite deposit, near Sussex, New Brunswick, Canada.

**Name:** For the Penobsquis mine, Canada, first source of the mineral.

**Type Material:** Canadian Museum of Nature, Ottawa, Canada, 81524.

**References:** (1) Grice, J.D., R.A. Gault, and J. Van Velthuisen (1996) Penobsquisite: a new borate mineral with a complex framework structure. *Can. Mineral.*, 34, 657–665. (2) (1997) *Amer. Mineral.*, 82, 208 (abs. ref. 1).