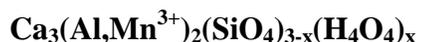


**Holtstamite**

**Crystal Data:** Tetragonal. *Point Group:* 4/m 2/m 2/m. As rounded composite grains to 3 mm; individual crystals, to 0.2 mm, are pseudo-octahedral by twinning. *Twinning:* Around [111].

**Physical Properties:** *Cleavage:* None. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 6 D(meas.) = n.d. D(calc.) = 3.25

**Optical Properties:** Transparent. *Color:* Pale brownish yellow. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Uniaxial (+).  $\omega = 1.718(2)$   $\varepsilon = 1.746(2)$  *Pleochroism:* Weak; *O* = pale orange; *E* = lemon yellow. *Absorption:*  $E > O$ .

**Cell Data:** *Space Group:*  $I4_1/acd$ .  $a = 12.337(3)$   $c = 11.930(5)$   $Z = 8$

**X-ray Powder Pattern:** Wessels mine, Kalahari manganese field, South Africa. 2.743 (100), 1.614 (56), 2.757 (55), 2.685 (54), 2.501 (47), 2.978 (45), 3.082 (44)

<b>Chemistry:</b>	(1)
SiO <sub>2</sub>	26.26
Al <sub>2</sub> O <sub>3</sub>	10.77
Mn <sub>2</sub> O <sub>3</sub>	11.64
Fe <sub>2</sub> O <sub>3</sub>	6.30
CaO	36.76
[H <sub>2</sub> O]	7.87
Total	99.61

(1) Wessels mine, Kalahari manganese field, South Africa; average of 15 electron microprobe analyses, H<sub>2</sub>O calculated, OH<sup>-</sup> confirmed by IR spectroscopy, Mn<sup>3+</sup> confirmed by optical absorption spectroscopy; corresponding to Ca<sub>3</sub>(Al<sub>0.96</sub>Mn<sup>3+</sup><sub>0.68</sub>Fe<sup>3+</sup><sub>0.37</sub>)<sub>Σ=2.01</sub>(SiO<sub>4</sub>)<sub>2.00</sub>(H<sub>4</sub>O<sub>4</sub>)<sub>0.99</sub>.

**Polymorphism and Series:** Polymorphous with hibschite; is the Al-analogue of henritermierite. Forms a solid solution series with henritermierite; crystals commonly compositionally zoned with cores of henritermierite and rims of holtstamite.

**Occurrence:** In a manganese-rich calc-silicate contact metamorphic rock.

**Association:** Mn<sup>3+</sup>-bearing vesuvianite, calcite, henritermierite

**Distribution:** Wessels mine, Kalahari manganese field, South Africa.

**Name:** Honors Dr. Dan Holtstam (b. 1963) for his contributions to Swedish mineralogy and specifically Mn deposits of the Långban type.

**Type Material:** Swedish Museum of Natural History, Stockholm, Sweden (960380).

**References:** (1) Hålenius, U., U. Häussermann, and H. Harryson. (2005) Holtstamite, Ca<sub>3</sub>(Al,Mn<sup>3+</sup>)<sub>2</sub>(SiO<sub>4</sub>)<sub>3-x</sub>(H<sub>4</sub>O<sub>4</sub>)<sub>x</sub>, a new tetragonal hydrogarnet from Wessels Mine, South Africa. *Eur. J. Mineral.*, 17, 375-382. (2) (2005) *Amer. Mineral.*, 90, 1946 (abs. ref. 1).