

Crystal Data: Monoclinic or triclinic. *Point Group:* 2/m (MDO₁ polytype) or 1 (MDO₂ polytype). Crystals tabular ⊥ [001], or acicular along [010], to 5 mm, and as aggregates. *Twinning:* On {001} or along [100], well-developed polysynthetic on a microscopic scale.

Physical Properties: *Cleavage:* Perfect on {001}, poor on {100}. Hardness = 4.5 D(meas.) = 2.58 D(calc.) = 2.69

Optical Properties: Semitransparent. *Color:* Colorless to white; colorless in thin section.

Luster: Vitreous.

Optical Class: Biaxial. $\alpha = 1.575$ $\beta = 1.580$ $\gamma = 1.585$ $2V(\text{meas.}) = \text{n.d.}$ $2V(\text{calc.}) = 89.8^\circ$

Cell Data: *Space Group:* Cc. $a = 11.331(9)$ $b = 7.353(7)$ $c = 22.67(2)$ $\beta = 96:59(7)^\circ$ MDO₁ $Z = 2$
C1. $a = 11.274(2)$ $b = 7.3439(7)$ $c = 11.468(2)$ $\alpha = 99.18(1)^\circ$ $\beta = 97.19(1)^\circ$ $\gamma = 90.09(1)^\circ$ MDO₂

X-ray Powder Pattern: Fuka, Japan.

11.25 (100), 3.034 (60), 2.794 (60), 3.304 (51), 3.068 (45), 2.811 (41), 3.012 (37)

Chemistry:	(1)
SiO ₂	46.55
TiO ₂	0.01
B ₂ O ₃	0.23
Al ₂ O ₃	0.36
Fe ₂ O ₃	0.01
MnO	0.06
MgO	0.11
CaO	39.04
Na ₂ O	0.02
K ₂ O	0.10
F	0.18
H ₂ O	13.75
- O = F ₂	0.08
Total	100.34

(1) Fuka, Japan; by electron microprobe, wet chemical analysis for B, F, and H₂O; corresponds to (Ca_{5.29}Mg_{0.02}K_{0.02}) $\Sigma=5.33$ (Si_{15.90}Al_{0.05}B_{0.05}) $\Sigma=6.00$ [O_{16.54}(OH)_{1.39}F_{0.07}] $\Sigma=18.00$ ·5.1H₂O.

Polymorphism & Series: Dimorphous with tobermorite. Two polytypes.

Occurrence: In gehlenite-spurrite-bearing skarns.

Association: Calcite, tobermorite, plombièrite, apophyllite.

Distribution: At Fuka, near Bicchu, Okayama Prefecture, Japan. From the Wessels mine, Kalahari manganese field, South Africa.

Name: A prefix, *clino*, for its monoclinic crystal system and chemical identity to *tobermorite*.

Type Material: National Science Museum, Tokyo, Japan.

References: (1) Henmi, C. and I. Kusachi (1989) Monoclinic tobermorite from Fuka, Bitchu-cho, Okayama Prefecture, Japan. *J. Japan. Assoc. Mineral. Petrol. Econ. Geol.*, 84, 374-379 (in Japanese with English abs.). (2) (1992) *Amer. Mineral.*, 77, 451 (abs. ref. 1). (3) Henmi, C. and I. Kusachi (1992) Clinotobermorite, Ca₅Si₆(O,OH)₁₈·5H₂O; a new mineral from Fuka, Okayama Prefecture, Japan. *Mineral. Mag.*, 56, 353-358. (4) (1993) *Amer. Mineral.*, 78, 672 (abs. ref. 3). (5) Hoffmann, C. and T. Armbruster (1997): Clinotobermorite, Ca₅[Si₃O₈(OH)]₂·4H₂O-Ca₅[Si₆O₁₇]·5H₂O, a natural C-S-H(I) type cement mineral: determination of the substructure. *Z. Kristallogr.*, 212, 864-873. (6) Merlino, S., E. Bonaccorsi, and T. Armbruster (2000) The real structures of clinotobermorite and tobermorite 9 Å: OD character, polytypes, and structural relationships. *Eur. J. Mineral.* 12, 411-429.