

**Crystal Data:** Monoclinic (*2M* polytype). *Point Group:* *m*. Typically, amorphous, a hardened gel; powdery, compact, massive.

**Physical Properties:** *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = ~4 D(meas.) = 2.20 D(calc.) = 2.23

**Optical Properties:** Transparent to translucent. *Color:* White, pink to red-brown. *Optical Class:* Biaxial (+) (relic). *n* = 1.50-1.55 2*V*(meas.) = n.d.

**Cell Data:** *Space Group:* *B11b* (non-standard cell setting; *2M* polytype). *a* = 6.735(2) *b* = 7.425(2) *c* = 27.987(5) *β* = 123.25(1)° *Z* = 2; *Space Group:* *F2dd* (*4O* polytype). *a* = 11.2 *b* = 7.3 *c* = 56

**X-ray Powder Pattern:** Ballycraigy, Ireland.

3.17 (msb), 3.01 (msb), 2.81 (ms), 1.83 (ms), 5.48 (wb), 2.07 (w), 1.67 (w)

<b>Chemistry:</b>	(1)	(2)	(3)	(4)
SiO <sub>2</sub>	40.6	40.4	41.43	45.92
Al <sub>2</sub> O <sub>3</sub>	1.3	2.4		
Fe <sub>2</sub> O <sub>3</sub>		0.8		
MgO		0.3		
CaO	34.1	32.6	32.94	35.72
H <sub>2</sub> O	23.2	23.3	[25.63]	18.36
Total	99.2	99.8	100.00	100.00

(1) Plombières, France. (2) Ballycraigy, Ireland. (3) Hatrurim Formation, Israel; by electron microprobe, H<sub>2</sub>O by difference. (4) Ca<sub>5</sub>Si<sub>6</sub>O<sub>16</sub>(OH)<sub>2</sub>·7H<sub>2</sub>O.

**Polymorphism & Series:** *2M* and *4O* polytypes.

**Mineral Group:** Tobermorite supergroup.

**Occurrence:** A gelatinous substance which hardens in air, formed from thermal waters (Plombières, France); a natural gel formed from hydration of bredigite and larnite at a diabase-chalk contact (Ballycraigy, Ireland).

**Association:** Zeolites (Plombières, France).

**Distribution:** From Plombières, Vosges, and from Boisséjour, near Ceyrat, Puy-de-Dôme, France. At Ballycraigy and Scawt Hill, near Larne, and Carneal, Co. Antrim, Ireland. From Klöch, Styria, Austria. In the Hatrurim Formation, Israel. At Crestmore, Riverside Co., California, USA [TL]. At Fuka, near Bicchu, Okayama Prefecture, Japan.

**Name:** For the French locality at *Plombières*.

**Type Material:** Natural History Museum, University of Pisa, Italy (19690).

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 570. (2) McConnell, J.D.C. (1954) The hydrated calcium silicates riversideite, tobermorite, and plombierite. *Mineral. Mag.*, 30, 293-305. (3) McConnell, J.D.C. (1955) The hydration of larnite ( $\beta$ -Ca<sub>2</sub>SiO<sub>4</sub>) and bredigite ( $\alpha$ <sub>1</sub>-Ca<sub>2</sub>SiO<sub>4</sub>) and the properties of the resulting gelatinous mineral plombierite. *Mineral. Mag.*, 30, 672-680. (4) Heller, L. and H.F.W. Taylor (1956) Crystallographic data for the calcium silicates. H.M. Stationary Office, London, 32-34. (5) Gross, S. (1977) The mineralogy of the Hatrurim Formation, Israel. *Geol. Sur. Israel Bull.* 70, 47. (6) Bonaccorsi, E. and S. Merlino (2005) The crystal structure of tobermorite 14 Å (plombierite), a C-S-H phase. *J. Am. Ceram. Soc.*, 88, 505-512. (7) (2005) *Amer. Mineral.*, 90(11), 1951 (abs. ref. 6). (8) Biagioni, C., S. Merlino, and E. Bonaccorsi (2015) The tobermorite supergroup: a new nomenclature. *Mineral. Mag.*, 79(2), 485-495.