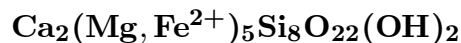


Tremolite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Elongated, stout prismatic, or flattened bladed crystals, to 20 cm; also fibrous, granular or columnar aggregates. *Twining:* Simple or multiple, common $\parallel \{100\}$; rarely multiple $\parallel \{001\}$.

Physical Properties: *Cleavage:* Perfect on $\{110\}$, intersecting at 56° and 124° ; partings on $\{010\}$, $\{100\}$. *Tenacity:* Brittle. Hardness = 5–6 D(meas.) = 2.99–3.03 D(calc.) = 2.964

Optical Properties: Transparent to translucent. *Color:* White, gray, lavender to pink; colorless in thin section. *Luster:* Vitreous.

Optical Class: Biaxial (-). *Orientation:* $Y = b$; $Z \wedge c = -21^\circ$ to -19° ; $X \wedge a = -6^\circ$ to -4° . *Dispersion:* $r < v$, weak. $\alpha = 1.605\text{--}1.613$ $\beta = 1.616\text{--}1.624$ $\gamma = 1.630\text{--}1.636$ $2V(\text{meas.}) = 86^\circ\text{--}88^\circ$

Cell Data: *Space Group:* $C2/m$. $a = 9.863(1)$ $b = 18.048(2)$ $c = 5.285(1)$
 $\beta = 104.79(1)^\circ$ $Z = 2$

X-ray Powder Pattern: St. Gotthard, Switzerland.

8.38 (100), 3.121 (100), 2.705 (90), 3.268 (75), 1.892 (50), 2.805 (45), 2.015 (45)

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	56.57	59.30	Na ₂ O	1.44	2.07
TiO ₂	0.01	trace	K ₂ O	0.68	0.61
Al ₂ O ₃	1.41	0.26	F	1.52	3.84
FeO	0.08	trace	Cl	0.05	trace
MnO	0.03	trace	H ₂ O ⁺	1.46	0.50
MgO	24.41	24.58	-O = (F, Cl) ₂	[0.64]	[1.62]
CaO	12.25	12.03	Total	[99.27]	[101.57]

(1) Gouverneur, New York, USA; Fe₂O₃ trace; corresponds to $(\text{Ca}_{1.80}\text{Na}_{0.38}\text{K}_{0.12})_{\Sigma=2.30}$ $(\text{Mg}_{5.00}\text{Fe}_{0.01}^{2+})_{\Sigma=5.00}$ $(\text{Si}_{7.77}\text{Al}_{0.23})_{\Sigma=8.00}\text{O}_{22}[(\text{OH})_{1.34}\text{F}_{0.66}\text{Cl}_{0.01}]_{\Sigma=2.01}$. (2) Balmat No. 3 mine, St. Lawrence Co., New York; by electron microprobe, original total given as 101.47%; corresponds to $(\text{Ca}_{1.74}\text{Na}_{0.54}\text{K}_{0.10})_{\Sigma=2.38}$ $(\text{Mg}_{4.95}\text{Al}_{0.04})_{\Sigma=4.99}\text{Si}_{8.01}\text{O}_{22}[\text{F}_{1.64}(\text{OH})_{0.35}\text{Cl}_{0.01}]_{\Sigma=2.00}$.

Polymorphism & Series: Forms a series with actinolite and ferro-actinolite.

Mineral Group: Amphibole (calcic) group: $\text{Mg}/(\text{Mg} + \text{Fe}^{2+}) \geq 0.90$; $(\text{Na} + \text{K})_{\text{A}} < 0.5$; $\text{Na}_{\text{B}} < 0.67$; $(\text{Ca} + \text{Na})_{\text{B}} \geq 1.34$; $\text{Si} \geq 7.5$.

Occurrence: From contact metamorphism of Ca-Mg siliceous sediments; in greenschist facies metamorphics derived from ultramafic or magnesium carbonate rocks.

Association: Calcite, dolomite, calcian garnet, wollastonite, talc, diopside, forsterite, cummingtonite, magnesio-cummingtonite, riebeckite, winchite.

Distribution: Notable localities include: on Campolungo Alp, Ticino, and Bristenstock, Uri, Switzerland. From St. Marcel, Piedmont, Italy. At Bilin, Czech Republic. In the USA, from Pierrepoint, Gouverneur, Edwards, and Macomb, St. Lawrence Co., New York; at Franklin, Sussex Co., New Jersey; and Lee, Berkshire Co., Massachusetts. At Wilberforce, Ontario, Canada. From Kozano, Badakhshan Province, Afghanistan. At Lelatema, Tanzania. In the Brumado mine, Bahia, Brazil.

Name: For an occurrence in the Tremola Valley, southern St. Gotthard Mountains, Switzerland. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of Mineral Data Publishing.

- References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 385–398. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 2, chain silicates, 249–262. (3) Hawthorne, F.C. and H.D. Grundy (1976) The crystal chemistry of the amphiboles: IV. X-ray and neutron refinements of the crystal structure of tremolite. *Can. Mineral.*, 14, 334–345. (4) Petersen, E.U., E.J. Essene, D.R. Peacor, and J.W. Valley (1982) Fluorine end-member micas and amphiboles. *Amer. Mineral.*, 67, 538–544. (5) Walitzi, E.M. and K. Ettinger (1986) Verfeinerung der Kristallstruktur eines Tremolites vom Ochsenkogel (Gleinalpe/Styria), Österreich. *Neues Jahrb. Mineral., Monatsh.*, 360–366 (in German). (6) Phillips, W.R. and D.T. Griffen (1981) *Optical mineralogy*, 229–231.