Tremolite  \[ \text{Ca}_2(\text{Mg}, \text{Fe}^{2+})_5\text{Si}_8\text{O}_{22}(\text{OH})_2 \]

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

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

**Optical Properties:** Transparent to translucent. \( \text{Color: } \) White, gray, lavender to pink; colorless in thin section. \( \text{Luster: } \) Vitreous.

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

**Cell Data:** \( \text{Space Group: } C2/m \). \( a = 9.863(1) \) \( b = 18.048(2) \) \( c = 5.285(1) \)

\[ \beta = 104.79(1)^\circ \] \( Z = 2 \)

**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:**

| \( \text{SiO}_2 \) | 56.57 | 59.30 | \( \text{Na}_2\text{O} \) | 1.44 | 2.07 |
| \( \text{TiO}_2 \) | 0.01 | trace | \( \text{K}_2\text{O} \) | 0.68 | 0.61 |
| \( \text{Al}_2\text{O}_3 \) | 1.41 | 0.26 | \( \text{F} \) | 1.52 | 3.84 |
| \( \text{FeO} \) | 0.08 | trace | \( \text{Cl} \) | 0.05 | trace |
| \( \text{MnO} \) | 0.03 | trace | \( \text{H}_2\text{O}^+ \) | 1.46 | 0.50 |
| \( \text{MgO} \) | 24.41 | 24.58 | \( -\text{O} = (\text{F}, \text{Cl})_2 \) | [0.64] | [1.62] |
| \( \text{CaO} \) | 12.25 | 12.03 | Total | [99.27] | [101.57] |

\( 1 \) Gouverneur, New York, USA; \( \text{Fe}_2\text{O}_3 \) trace; corresponds to \( \text{(Ca}_{1.80}\text{Na}_{0.38}\text{K}_{0.12})_{\Sigma=2.30} \) \( \text{(Mg}_{5.50}\text{Fe}_{2.01})_{\Sigma=5.00} \text{(Si}_{7.77}\text{Al}_{0.23})_{\Sigma=8.00} \text{O}_{22}(\text{OH})_{1.34}\text{F}_{0.66}\text{Cl}_{0.01})_{\Sigma=2.01} \) \( 2 \) Balmat No. 3 mine, St. Lawrence Co., New York; by electron microprobe, original total given as 101.47%; corresponds to \( \text{(Ca}_{1.74}\text{Na}_{0.54}\text{K}_{0.16})_{\Sigma=2.38} \text{(Mg}_{4.95}\text{Al}_{0.04})_{\Sigma=8.00} \text{Si}_{8.01} \text{O}_{22}(\text{F}_{1.64}(\text{OH})_{0.35}\text{Cl}_{0.01})_{\Sigma=2.00} \).

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

**Mineral Group:** Amphibole (calcic) group: Mg/(Mg + Fe\(^{2+}\)) \( > 0.90 \); \( (\text{Na + K})_A < 0.5; \text{Na}_B \) \( < 0.67; (\text{Ca + Na})_B \) \( \geq 1.34; \text{Si} \geq 7.5 \).

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

**Association:** Calcite, dolomite, calcic 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 Blin, Czech Republic. In the USA, from Pierrepont, 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.