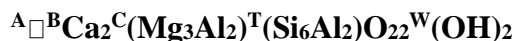


Ferro-tschermakite

Crystal Data: Monoclinic. *Point Group:* 2/m. As bladed to acicular crystals. *Twinning:* [Simple or multiple twinning || {100}.]

Physical Properties: *Cleavage:* [Perfect on {110}, with intersections at ~56° and ~124°; partings on {100} and {001}.] *Tenacity:* [Brittle.] *Hardness:* [5-6] *D(calc.):* = 3.260

Optical Properties: Translucent. *Color:* Dark green. *Streak:* Dark green. *Luster:* Vitreous. *Optical Class:* Biaxial (-). $\alpha = 1.666(2)$ $\beta = 1.680(2)$ $\gamma = 1.690(2)$ $2V(\text{meas.}) = 84(1)^\circ$ $2V(\text{calc.}) = 79.8^\circ$ *Orientation:* $X \wedge a = 9.5^\circ$ (in β acute), $Y \parallel b$, $Z \wedge c = 24.3^\circ$ (in β obtuse). *Dispersion:* Medium; $r > v$. *Pleochroism:* $X =$ pale yellow-green, $Y =$ olive green, $Z =$ blue green.

Cell Data: *Space Group:* C2/m. $a = 9.7598(6)$ $b = 18.0220(11)$ $c = 5.3299(3)$
 $\beta = 104.826(1)^\circ$ $Z = 2$

X-ray Powder Pattern: Calculated pattern.

8.359 (100), 2.708 (84), 3.098 (55), 2.552 (43), 2.595 (41), 2.330 (33), 2.159 (27)

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	41.32	39.61	NiO	0.01	
TiO ₂	0.37		ZnO	0.02	
Al ₂ O ₃	18.13	22.41	CaO	10.58	12.32
Cr ₂ O ₃	0.02		Na ₂ O	1.61	
V ₂ O ₃	0.05		K ₂ O	0.45	
FeO _{total}	17.55		H ₂ O	[1.96]	1.98
FeO	[15.66]	23.68	F	0.12	
Fe ₂ O ₃	[2.09]		<u>-O = F₂</u>	<u>0.05</u>	
MgO	6.94		Total	99.47	100.00
MnO	0.20				

(1) La Clarté, Perros-Guirec, Brittany, France; average of 10 electron microprobe analyses, H₂O calculated for 2(OH,F) apfu, Fe³⁺/Fe_{total} calculated from stoichiometry and structure; corresponds to $A(Na_{0.29}K_{0.08})_{\Sigma=0.37}B(Ca_{1.69}Fe^{2+}_{0.11}Mn^{2+}_{0.02}Na_{0.18})_{\Sigma=2.00}C(Fe^{2+}_{1.84}Mg_{1.54}Al_{1.33}Fe^{3+}_{0.24}V^{3+}_{0.01}Ti_{0.04})_{\Sigma=5.00}T(Si_{6.15}Al_{1.85})_{\Sigma=8.00}O_{22}^W(OH_{1.94}F_{0.06})_{\Sigma=2.00}$. (2) $A_{\square}B_{\square}Ca_2C(Mg_3Al_2)^T(Si_6Al_2)O_{22}^W(OH)_2$.

Polymorphism & Series: Forms a series with tschermakite.

Mineral Group: Calcium amphibole group; $B(Ca+\Sigma M^{2+})/\Sigma B \geq 0.75$, $B_{Ca}/\Sigma B \geq B_{\Sigma M^{2+}}/\Sigma B$.

Occurrence: A rock-forming mineral in granitic pegmatite in a batholith. In a variety of metamorphic rocks (amphibolite, metacarbonate, schist, gneiss).

Association: Plagioclase, staurolite, almandine, biotite, chlorite.

Distribution: Granite quarries, Ploumanac'h Granitic Complex, La Clarté, Perros-Guirec, Brittany, France. Also confirmed from Ovala, Gabon; Waits River, Vermont and Joyceville, Massachusetts, USA; Lake Kutemajärvi and Permiö, Finland; and the Froid Mine, Sudbury, Canada.

Name: For *ferrous* iron in its composition and relation to *tschermakite*.

Type Material: Mineral Museum, University of Pavia, Italy (2016-02).

References: (1) Oberti, R., M. Boiocchi, F.C. Hawthorne, and M.E. Ciriotti (2018) Ferro-tschermakite from the Ploumanac'h granitic complex, Brittany, France: mineral description. *Eur. J. Mineral.*, 30(1), 171-176. (2) (2018) *Amer. Mineral.*, 103, 2040-2041 (abs. ref. 1). (3) Hawthorne, F.C., R. Oberti, G.E. Harlow, W.V. Maresch, R.F. Martin, J.C. Schumacher, and M.D. Welch (2012) Nomenclature of the amphibole supergroup. *Amer. Mineral.*, 97, 2031-2048.