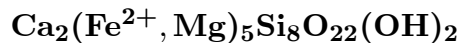


**Ferro-actinolite**



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . [As bladed or columnar crystals; also radiating fibrous; granular, massive.] *Twinning:* Simple or lamellar twinning  $\parallel \{100\}$ .

**Physical Properties:** *Cleavage:* Perfect on  $\{110\}$ , intersecting at  $56^\circ$  and  $124^\circ$ ; parting on  $\{100\}$ . *Tenacity:* Brittle. Hardness = 5–6 D(meas.) = 3.24–3.48 D(calc.) = [3.34]

**Optical Properties:** Transparent to translucent. *Color:* Dark green; in thin section, yellow-green or blue-green. *Luster:* Vitreous.

*Optical Class:* Biaxial (-). *Pleochroism:* Moderate to strong, in yellows and greens.

*Orientation:*  $Y = b$ ;  $Z \wedge c = 12.5^\circ\text{--}17^\circ$ . *Dispersion:*  $r > v$ , weak. *Absorption:*  $Z > Y \geq X$ .  $\alpha = 1.646\text{--}1.686$   $\beta = 1.656\text{--}1.696$   $\gamma = 1.666\text{--}1.704$   $2V(\text{meas.}) = 71^\circ\text{--}81^\circ$

**Cell Data:** *Space Group:*  $C2/m$ .  $a = 9.891(1)$   $b = 18.200(1)$   $c = 5.305(1)$   
 $\beta = 104.64(1)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Prieska, South Africa. (ICDD 23-118).

8.58 (100), 2.728 (40), 3.157 (35), 2.033 (30), 2.546 (25), 4.57 (20), 2.613 (18)

Chemistry:	(1)	(2)	(1)	(2)
SiO <sub>2</sub>	51.0	49.89	Na <sub>2</sub> O	0.35
TiO <sub>2</sub>	0.04	1.04	K <sub>2</sub> O	0.16
Al <sub>2</sub> O <sub>3</sub>	2.0	0.75	F	0.14
Fe <sub>2</sub> O <sub>3</sub>	2.8		H <sub>2</sub> O <sup>+</sup>	1.6
FeO	19.9	30.62	H <sub>2</sub> O <sup>-</sup>	0.11
MnO	2.4	0.07	CO <sub>2</sub>	0.19
MgO	8.6	4.59	P	0.09
CaO	10.7	10.99	-O = F <sub>2</sub>	0.06
			Total	100.02
				98.14

(1) Cumberland, Rhode Island, USA; corresponds to  $(\text{Ca}_{1.74}\text{Mn}_{0.17}\text{Na}_{0.10}\text{K}_{0.03})_{\Sigma=2.04}(\text{Fe}_{2.53}^{2+}\text{Mg}_{1.94}\text{Fe}_{0.31}^{3+}\text{Mn}_{0.14}\text{Al}_{0.08})_{\Sigma=5.00}(\text{Si}_{7.72}\text{Al}_{0.28})_{\Sigma=8.00}\text{O}_{22}(\text{OH})_2$ . (2) Jackson County Iron Formation, Wisconsin, USA; by electron microprobe, corresponds to  $(\text{Ca}_{1.86}\text{Na}_{0.03}\text{K}_{0.02})_{\Sigma=1.91}(\text{Fe}_{3.98}^{2+}\text{Mg}_{1.08}\text{Fe}_{0.06}^{3+}\text{Ti}_{0.01}\text{Mn}_{0.01}\text{Al}_{0.01})_{\Sigma=5.15}(\text{Si}_{7.87}\text{Al}_{0.13})_{\Sigma=8.00}\text{O}_{22}(\text{OH})_2$ .

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

**Mineral Group:** Amphibole (calcic) group:  $\text{Mg}/(\text{Mg} + \text{Fe}^{2+}) < 0.50$ ;  $(\text{Na} + \text{K})_A < 0.5$ ;  $\text{Na}_B < 0.67$ ;  $(\text{Ca} + \text{Na})_B \geq 1.34$ ;  $\text{Si} \geq 7.5$ .

**Occurrence:** In iron-rich greenschist and blueschist facies metamorphic rocks; in metamorphosed iron formations; as part of a vein assemblage cutting Ca-Fe-Si tactites.

**Association:** Hedenbergite (replacement), andradite, ilvaite (contact metamorphic); cummingtonite, quartz, magnetite, riebeckite, biotite, hematite (iron formations).

**Distribution:** Probably widespread, but many locality references lack qualifying chemical analyses. In the USA, in the Jackson County Iron Formation, Wisconsin, and at Cumberland, Providence Co., Rhode Island. From Black Perry Mountain, New South Wales, Australia. At Prieska, Cape Province, South Africa.

**Name:** For *ferrous* iron in its composition and similarity to *actinolite*.

**Type Material:** n.d.

**References:** (1) Mitchell, J.T., F.D. Bloss, and G.V. Gibbs (1971) Examination of the actinolite structure and four other  $C2/m$  amphiboles in terms of double bonding. *Zeits. Krist.*, 133, 273–300. (2) Kimball, K.L. and F.S. Spear (1984) Metamorphic petrology of the Jackson County Iron Formation, Wisconsin. *Can. Mineral.*, 22, 605–619. (3) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 2, chain silicates, 249–262. (4) Phillips, W.R. and D.T. Griffen (1981) Optical mineralogy, 229–231.

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