

# Chondrodite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . Crystals rare, varied in habit, typically flattened  $\parallel$  [010], to 10 cm. Commonly as rounded grains, massive. *Twinning:* On {001}, common, simple and lamellar; possibly  $\parallel$  {015} and {305}.

**Physical Properties:** *Cleavage:* {100} indistinct; parting on {001}. *Tenacity:* Brittle. Hardness = 6–6.5  $D(\text{meas.}) = 3.16\text{--}3.26$   $D(\text{calc.}) = 3.177$

**Optical Properties:** Transparent to translucent. *Color:* Light yellow, yellow, brown, red; in thin section, pale yellow or brown to colorless. *Luster:* Vitreous to resinous.

*Optical Class:* Biaxial (+). *Pleochroism:*  $X =$  colorless, very pale yellow, brownish yellow;  $Y =$  colorless, yellow-green;  $Z =$  colorless, pale green. *Orientation:*  $Z = b$ ;  $X \wedge c = 22^\circ\text{--}31^\circ$ . *Dispersion:*  $r > v$ , strong to weak.  $\alpha = 1.592\text{--}1.643$   $\beta = 1.602\text{--}1.655$   $\gamma = 1.621\text{--}1.676$   $2V(\text{meas.}) = 71^\circ\text{--}85^\circ$

**Cell Data:** *Space Group:*  $P2_1/c$ .  $a = 7.8404(2)$   $b = 4.7284(3)$   $c = 10.2539(3)$   
 $\beta = 109^\circ 2'$   $Z = 2$

**X-ray Powder Pattern:** Tilly Foster mine, New York, USA. (ICDD 12-527).  
2.258 (100), 1.740 (70), 3.02 (45), 2.510 (45), 3.56 (35), 2.758 (35), 2.288 (35)

Chemistry:	(1)	(2)	(1)	(2)	
SiO <sub>2</sub>	33.60	32.16	MgO	59.30	53.21
TiO <sub>2</sub>	0.06	0.20	CaO	0.00	0.00
Al <sub>2</sub> O <sub>3</sub>	0.24	0.73	F	6.61	7.11
Fe <sub>2</sub> O <sub>3</sub>	0.05	0.60	H <sub>2</sub> O <sup>+</sup>	1.46	1.20
FeO	0.86	6.08	H <sub>2</sub> O <sup>-</sup>	0.00	0.00
MnO	0.16	1.35	-O = F <sub>2</sub>	2.78	2.99
			Total	99.56	99.65

(1) Hangelby, Finland; corresponds to  $(\text{Mg}_{5.13}\text{Fe}_{0.04}^{2+}\text{Al}_{0.02}\text{Mn}_{0.01})_{\Sigma=5.20}\text{Si}_{1.95}\text{O}_8$   
 $[\text{F}_{1.21}(\text{OH})_{0.56}\text{O}_{0.23}]_{\Sigma=2.00}$ . (2) Kafveltorp, Sweden; corresponds to  $(\text{Mg}_{4.74}\text{Fe}_{0.30}^{2+}\text{Mn}_{0.07}$   
 $\text{Al}_{0.05}\text{Fe}_{0.03}^{3+}\text{Ti}_{0.01})_{\Sigma=5.20}\text{Si}_{1.92}\text{O}_8$  $[\text{F}_{1.34}(\text{OH})_{0.48}\text{O}_{0.18}]_{\Sigma=2.00}$ .

**Polymorphism & Series:** Forms a series with alleghanyite.

**Mineral Group:** Humite group.

**Occurrence:** In contact metamorphic zones, in limestones and dolostones, associated with felsic to alkalic plutonic rocks, especially with Fe-B-F metasomatism; in a carbonatite.

**Association:** Phlogopite, spinel, magnetite, grossular, wollastonite, forsterite, monticellite, cuspidine, diopside, calcite.

**Distribution:** From Pargas, Hangelby, and Sibbo, Finland. At Kafveltorp, near Kopparberg, Sweden. From Monte Somma and Vesuvius, Campania, Italy. At Le Chival, Vosges, France. From Bhandara, Maharashtra, India. In the USA, fine crystals from the Tilly Foster mine, Brewster, Putnam Co., and Amity, Orange Co., New York; at Franklin and Sparta, Sussex Co., New Jersey; Johnson Camp, Cochise Co., and the Lakeshore mine, Pinal Co., Arizona; and Crestmore, Riverside Co., California. From Bancroft, Ontario, Canada. In the Loolekop carbonatite, Transvaal, South Africa. A few other localities are known.

**Name:** From the Greek meaning *grain*, alluding to its occurrence in isolated grains.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 536–538. (2) Deer, W.A., R.A. Howie, and J. Zussman (1982) Rock-forming minerals, (2nd edition), v. 1A, orthosilicates, 379–417. (3) Gibbs, G.V., P.H. Ribbe, and C.P. Anderson (1970) The crystal structures of the humite minerals. II. Chondrodite. Amer. Mineral., 55, 1182–1194. (4) Phillips, W.R. and D.T. Griffen (1981) Optical mineralogy, 142–144.

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