

# Omphacite

# (Ca, Na)(Mg, Fe, Al)Si<sub>2</sub>O<sub>6</sub>

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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . Rarely in rough crystals, to 5 cm; anhedral, granular to massive. *Twining:* Single and polysynthetic twinning on {100}, common.

**Physical Properties:** *Cleavage:* Good on {110}, (110)  $\wedge$  ( $\bar{1}\bar{1}0$ )  $\sim 87^\circ$ ; parting on {100}. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 5–6 D(meas.) = 3.16–3.43 D(calc.) = [3.36]

**Optical Properties:** Translucent. *Color:* Green to dark green; colorless to pale green in thin section. *Luster:* Vitreous to silky.

*Optical Class:* Biaxial (+). *Pleochroism:* Weak; X = colorless; Y = very pale green; Z = very pale green, blue-green. *Orientation:* Y = b; Z  $\wedge$  c =  $36^\circ$ – $48^\circ$ . *Dispersion:*  $r > v$ , moderate.  $\alpha = 1.662$ – $1.701$   $\beta = 1.670$ – $1.712$   $\gamma = 1.685$ – $1.723$   $2V(\text{meas.}) = 56^\circ$ – $84^\circ$

**Cell Data:** *Space Group:*  $C2/c$  or  $P2/n$ .  $a = 9.45$ – $9.68$   $b = 8.57$ – $8.90$   $c = 5.23$ – $5.28$   $\beta = 105^\circ$ – $108^\circ$   $Z = 4$

**X-ray Powder Pattern:** Hareidland, Sunnmøre, Norway.

2.976 (100), 1.402 (80), 2.127 (70), 2.118 (70), 2.019 (70), 4.4 (50), 3.19 (50)

Chemistry:	(1)	(2)	(1)	(2)	
SiO <sub>2</sub>	54.08	55.25	MnO	trace	0.04
TiO <sub>2</sub>	0.14	0.23	MgO	11.51	7.23
Al <sub>2</sub> O <sub>3</sub>	9.20	16.17	CaO	17.50	12.34
Fe <sub>2</sub> O <sub>3</sub>	0.83	1.64	Na <sub>2</sub> O	4.20	6.19
Cr <sub>2</sub> O <sub>3</sub>		0.04	K <sub>2</sub> O	0.04	0.11
FeO	2.18	1.36	H <sub>2</sub> O <sup>+</sup>	0.46	
			Total	100.14	100.60

(1) Kupplerbrunn, Austria; corresponds to (Ca<sub>0.58</sub>Na<sub>0.32</sub>) $_{\Sigma=0.90}$ (Mg<sub>0.61</sub>Al<sub>0.31</sub>Fe<sub>0.06</sub><sup>2+</sup>Ti<sub>0.04</sub>Fe<sub>0.02</sub><sup>3+</sup>) $_{\Sigma=1.04}$ (Si<sub>1.93</sub>Al<sub>0.07</sub>) $_{\Sigma=2.00}$ O<sub>6</sub>. (2) Yakutia, Russia; corresponds to (Ca<sub>0.46</sub>Na<sub>0.42</sub>K<sub>0.01</sub>) $_{\Sigma=0.89}$ (Al<sub>0.58</sub>Mg<sub>0.38</sub>Fe<sub>0.04</sub><sup>3+</sup>Fe<sub>0.04</sub><sup>2+</sup>Ti<sub>0.01</sub>) $_{\Sigma=1.05}$ (Si<sub>1.92</sub>Al<sub>0.08</sub>) $_{\Sigma=2.00}$ O<sub>6</sub>.

**Polymorphism & Series:** A clinopyroxene solid solution of jadeite (25%–75%), augite (25%–75%), and aegirine (0%–25%).

**Mineral Group:** Pyroxene group.

**Occurrence:** A major constituent of eclogite, commonly in kimberlite pipes; from some ophiolites and glaucophane-bearing blueschist facies rocks.

**Association:** Garnet, quartz, kyanite, corundum (eclogite); “hornblende,” scapolite, epidote, glaucophane (blueschists).

**Distribution:** A widespread mineral. Some localities for studied material are: in Germany, from Hof, near Bayreuth, Bavaria. At Kupplerbrunn, Saualpe, and Gertrusk, Carinthia, Austria. From Eiksundal, Sunnmøre, Naustdal, Vanelvsdalen, and Møre, Norway. In Russia, in the Yakutia diamond pipes, as at Mir, Zagadochnaya, and Obnazhennaya. From Kimberley, Cape Province, South Africa. At Shibukawa, Gumma Prefecture, and in the Ohmi district, Niigata Prefecture, Japan. In the USA, on the Tiburon Peninsula, Marin Co., and on into Sonoma Co., California.

**Name:** From the Greek for *unripe grape*, in allusion to its green color.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 357. (2) Deer, W.A., R.A. Howie, and J. Zussman (1978) Rock-forming minerals, (2nd edition), v. 2A, single-chain silicates, 424–459. (3) Matsumoto, T., M. Tokonami, and N. Morimoto (1975) The crystal structure of omphacite. Amer. Mineral., 60, 634–641. (4) Warner, J. (1964) X-ray crystallography of omphacite. Amer. Mineral., 49, 1461–1467.

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