

Magnesio-hornblende



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Crystal Data: Monoclinic. *Point Group:* $2/m$. As prismatic crystals; as reaction rims on pyroxenes. *Twinning:* Simple or lamellar twinning $\parallel \{100\}$.

Physical Properties: *Cleavage:* Perfect on $\{110\}$, intersecting at 56° and 124° ; partings on $\{100\}$, $\{010\}$. *Tenacity:* [Brittle.] *Hardness* = [5–6] $D(\text{meas.}) = 3.10\text{--}3.28$ $D(\text{calc.}) = 3.26$

Optical Properties: Semitransparent. *Color:* Green, brown. *Luster:* [Vitreous to pearly.] *Optical Class:* Biaxial (–). *Pleochroism:* $X = \text{yellow}$; $Y = Z = \text{green}$. *Orientation:* $Y = b$; $Z \wedge c = 15^\circ\text{--}19^\circ$. $\alpha = 1.675$ $\beta = 1.690$ $\gamma = 1.695$ $2V(\text{meas.}) = 56^\circ$

Cell Data: *Space Group:* $C2/m$. $a = 9.887(2)$ $b = 18.174(5)$ $c = 5.308(5)$
 $\beta = 104^\circ 58(2)'$ $Z = 2$

X-ray Powder Pattern: Sierra Nevada batholith, California, USA.

3.136 (100), 8.51 (56), 2.720 (33), 3.291 (26), 2.818 (19), 2.172 (19), 1.656 (18)

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	48.20	44.12	Na ₂ O	1.96	1.18
TiO ₂	1.00	1.26	K ₂ O	0.41	0.88
Al ₂ O ₃	10.00	8.82	F		0.14
Fe ₂ O ₃	3.50	5.53	Cl		0.07
FeO	10.60	14.77	H ₂ O ⁺	2.22	1.80
MnO	0.17	0.50	H ₂ O [–]	0.45	0.00
MgO	10.06	9.19	–O = (F, Cl) ₂		0.08
CaO	10.59	11.74	Total	99.16	99.92

(1) Sibukawa district, central Japan; corresponds to $(\text{Ca}_{1.66}\text{Na}_{0.55}\text{K}_{0.08})_{\Sigma=2.29}(\text{Mg}_{2.18}\text{Fe}_{1.29}^{2+}\text{Fe}_{0.39}^{3+}\text{Al}_{0.76}\text{Ti}_{0.10}\text{Mn}_{0.02})_{\Sigma=4.74}(\text{Si}_{7.04}\text{Al}_{0.96})_{\Sigma=8.00}[\text{O}_{21.84}(\text{OH})_{0.16}]_{\Sigma=22.00}(\text{OH})_{2.00}$. (2) Sierra Nevada batholith, California, USA; corresponds to $(\text{Ca}_{1.90}\text{Na}_{0.35}\text{K}_{0.17})_{\Sigma=2.42}(\text{Mg}_{2.07}\text{Fe}_{1.86}^{2+}\text{Fe}_{0.63}^{3+}\text{Al}_{0.23}\text{Ti}_{0.14}\text{Mn}_{0.06})_{\Sigma=4.99}(\text{Si}_{6.66}\text{Al}_{1.34})_{\Sigma=8.00}\text{O}_{22}[(\text{OH})_{1.87}\text{F}_{0.07}\text{Cl}_{0.02}]_{\Sigma=1.96}$.

Polymorphism & Series: Forms a series with ferrohornblende.

Mineral Group: Amphibole (calcic) group: $\text{Mg}/(\text{Mg} + \text{Fe}^{2+}) \geq 0.50$; $(\text{Na} + \text{K})_{\text{A}} < 0.5$; $\text{Na}_{\text{B}} < 0.67$; $(\text{Ca} + \text{Na})_{\text{B}} \geq 1.34$; 6.50 Si 7.24.

Occurrence: Common in amphibolites, schists, and pegmatitic alkalic gabbro. Also from welded tuffs, granodiorites, granites, and tonalites.

Association: Quartz, orthoclase, plagioclase, biotite, magnetite, apatite (granite).

Distribution: Very widespread. A few confirmed localities include: at Vesuvius and Monte Somma, Campania, Italy. In the granitic batholiths of the Scottish Highlands; Swiss and Italian Alps; Harz Mountains, Germany; Finland and Sweden. In the Southern California and Sierra Nevada batholiths, California, USA. Widespread in Japan.

Name: For its high *magnesium* content and from the German for *horn* and *to deceive*, in allusion to its similarity to valuable minerals in ores.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 385–398 [hornblende, in part]. (2) Dodge, F.C.W., J.J. Papike, and R.E. Mays (1968) Hornblendes from granitic rocks of the central Sierra Nevada batholith. *J. Petrol.*, 9, 378–410. (3) Leake, B.E. (1968) A catalog of analyzed calciferous and subcalciferous amphiboles together with their nomenclature and associated minerals. *Geol. Soc. Amer. Special Paper* 98, 210 p. [analysis 216].

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