

Magnesio-hornblende

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

Physical Properties: *Cleavage:* Good on {110}, with intersections at ~56° and ~124°.
Tenacity: [Brittle.] *Hardness* = [5-6] *D(calc.)* = 3.137

Optical Properties: Translucent. *Color:* Green to dark green. *Streak:* n.d. *Luster:* Vitreous.
Optical Class: Biaxial (-). $\alpha = 1.640(2)$ $\beta = 1.654(2)$ $\gamma = 1.666(2)$ $2V(\text{meas.}) = 82(1)^\circ$
 $2V(\text{calc.}) = 84.9^\circ$ *Orientation:* $X \wedge a = 33.7^\circ$ (in β obtuse), $Y \parallel b$, $Z \wedge c = 18.2^\circ$ (in β acute).
Dispersion: Weak, $v > r$. *Pleochroism:* $X =$ pale yellow, $Y =$ bluish green, $Z =$ dark green.
Absorption: $Z > Y > X$.

Cell Data: *Space Group:* C2/m. $a = 9.8308(7)$ $b = 18.0659(11)$ $c = 5.2968(4)$ $\beta = 104.771(6)^\circ$
 $Z = 2$

X-ray Powder Pattern: Calculated pattern.

(100) 2.709, (74) 8.412, (73) 3.121, (58) 2.541, (49) 3.386, (45) 2.596, (41) 2.338

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	50.24	51.68	NiO	0.03	
TiO ₂	0.24		CaO	11.68	13.78
Al ₂ O ₃	6.52	12.50	Na ₂ O	0.92	
Cr ₂ O ₃	0.10		K ₂ O	0.30	
V ₂ O ₃	0.03		H ₂ O	[2.02]	
Fe ₂ O ₃	[2.17]		F	0.11	
FeO	[8.87]		Cl	0.10	
MgO	16.52	19.80	-O = Cl ₂	0.02	
MnO	0.25		<u>-O = F₂</u>	<u>0.05</u>	<u>2.21</u>
ZnO	0.02		Total	100.05	100.00

(1) Lüderitz, Karas Region, Namibia; average of 10 electron microprobe analyses, Fe³⁺/Fe²⁺ apportioned from FeO = 10.82 and H₂O calculated from structure; corresponds to
 $^A(\square_{0.73}\text{Na}_{0.22}\text{K}_{0.05})_{\Sigma=1.00}^B(\text{Ca}_{1.79}\text{Fe}^{2+}_{0.10}\text{Mg}_{0.04}\text{Mn}^{2+}_{0.03}\text{Na}_{0.04})_{\Sigma=2.00}^C(\text{Mg}_{3.48}\text{Fe}^{2+}_{0.97}\text{Al}_{0.28}\text{Fe}^{3+}_{0.23}\text{Cr}^{3+}_{0.01}\text{Ti}_{0.03})_{\Sigma=5.00}^T(\text{Si}_{7.18}\text{Al}_{0.82})_{\Sigma=8.00}\text{O}_{22}^W[(\text{OH})_{1.93}\text{F}_{0.05}\text{Cl}_{0.02}]_{\Sigma=2.00}$. (2) $\square \text{Ca}_2(\text{Mg}_4\text{Al})(\text{Si}_7\text{Al})\text{O}_{22}(\text{OH})_2$.

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

Occurrence: A rock-forming mineral.

Association: n.d.

Distribution: The sand dunes of Lüderitz, Karas Region, Namibia.

Name: Indicates a calcium amphibole with composition between 0.5 and 1.5 apfu $^C(\text{Al} + \text{Fe}^{3+} + 2\text{Ti})$ and between 0 and 0.5 apfu (Na+K+2Ca).

Type Material: Mineralogy Museum, University of Pavia, Italy (2017-01 and 1325 in the amphibole database of the CNR-IGG).

References: (1) Oberti, R., M. Boiocchi, F.C. Hawthorne, and M.E. Ciriotti (2018) Magnesio-hornblende from Lüderitz, Namibia: mineral description and crystal chemistry. *Mineral. Mag.*, 82(6), 1253-1259. (2) (2020) *Amer. Mineral.*, 105(7), 1113 (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.