

**Defernite**

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**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$ . As anhedral platy crystals, to 2 cm, flattened on {010}; in fan-shaped forms.

**Physical Properties:** *Cleavage:* Perfect on {010}; distinct on {100}. *Fracture:* Conchoidal to splintery. Hardness = n.d.  $D(\text{meas.}) = 2.34\text{--}2.5$   $D(\text{calc.}) = 2.31\text{--}2.42$

**Optical Properties:** Transparent. *Color:* Colorless to deep red or rose-brown. *Streak:* Pink. *Luster:* Vitreous.

*Optical Class:* Biaxial (-). *Pleochroism:* Strong;  $X = \text{ocher-brown}$ ;  $Y = \text{brownish orange to ocher-brown}$ ;  $Z = \text{colorless to yellow}$ . *Orientation:*  $X = c$ ;  $Y = b$ ;  $Z = a$ . *Dispersion:*  $r > v$ , weak.  $\alpha = 1.544(2)$   $\beta = 1.580(2)$   $\gamma = 1.584(2)$   $2V(\text{meas.}) = 38(2)^\circ$

**Cell Data:** *Space Group:*  $Pnam$ .  $a = 17.82\text{--}17.86$   $b = 22.62\text{--}22.78$   $c = 3.63\text{--}3.66$   $Z = 8$

**X-ray Powder Pattern:** Güneyce-İkizdere, Turkey.

11.37 (100), 2.899 (50), 3.045 (40), 8.29 (35), 2.418 (35), 1.962 (35), 5.68 (30)

**Chemistry:**

	(1)	(2)
SiO <sub>2</sub>	1.2	3.6
FeO		0.1
MnO		1.2
MgO		0.1
CaO	62.9	65.0
Cl	3.3	3.5
H <sub>2</sub> O <sup>+</sup>	[19.94]	11.47
CO <sub>2</sub>	13.4	16.3
-O = Cl <sub>2</sub>	0.74	0.8
Total	[100.00]	100.5

(1) Güneyce-İkizdere, Turkey; by electron microprobe, average of 18 analyses on three samples, H<sub>2</sub>O by difference; corresponds to Ca<sub>6.00</sub>(CO<sub>3</sub>)<sub>1.62</sub>(SiO<sub>4</sub>)<sub>0.1</sub>(OH)<sub>7.82</sub>Cl<sub>0.50</sub>•2.00H<sub>2</sub>O (with zeolitic H<sub>2</sub>O). (2) Kombat mine, Namibia; preferred values obtained from analysis by AA, electron microprobe, Heraeus CHN analyzer, and the Penfield method; corresponds to (Ca<sub>5.90</sub>Mn<sub>0.09</sub>Mg<sub>0.01</sub>)<sub>Σ=6.00</sub>(CO<sub>3</sub>)<sub>1.88</sub>(SiO<sub>4</sub>)<sub>0.30</sub>(OH)<sub>6.48</sub>Cl<sub>0.50</sub>.

**Occurrence:** In skarn at a granite-limestone contact (Güneyce-İkizdere, Turkey); throughout a body of unbanded, granular massive hausmannite (Kombat mine, Namibia).

**Association:** Vesuvianite, wollastonite, andradite, diopside, calcite, rustumite, spurrite, hillebrandite (Güneyce-İkizdere, Turkey); hausmannite, hillebrandite, brucite, crednerite, barite, calcite, vesuvianite, jacobsonite, hematite, copper (Kombat mine, Namibia).

**Distribution:** From the Güneyce-İkizdere area, Trabzon Province, Turkey. In the Kombat mine, 49 km south of Tsumeb, Namibia.

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**Type Material:** Museum of Natural History, Geneva, Switzerland, 435/30; National Museum of Natural History, Washington, D.C., USA, 163241.

**References:** (1) Sarp, H., M.F. Taner, J. Deferne, H. Bizouard, and B.W. Liebich (1980) La defernite, Ca<sub>6</sub>(CO<sub>3</sub>)<sub>2</sub>(OH, Cl)<sub>8</sub>•nH<sub>2</sub>O, un nouveau carbonate de calcium chloro-hydroxylé. Bull. Minéral., 103, 185–189 (in French with English abs.). (2) (1980) Amer. Mineral., 65, 1066 (abs. ref. 1). (3) Liebich, B.W. and H.S. Sarp (1985) La structure cristalline de la defernite. Schweiz. Mineral. Petrog. Mitt., 65, 153–158 (in French with English abs.). (4) Peacor, D.R., H. Sarp, P.J. Dunn, J. Innes, and J.A. Nelen (1988) Defernite from the Kombat mine, Namibia: a second occurrence, structure refinement, and crystal chemistry. Amer. Mineral., 73, 888–893.

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