Clinozoisite $Ca_2Al_3(SiO_4)(Si_2O_7)O(OH)$

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Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals prismatic, typically elongated and striated ‖ [010]; commonly coarse to fine granular; also fibrous. *Twinning:* Lamellar on {100}, uncommon.

Physical Properties: *Cleavage:* Perfect on {001}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 6.5 D(meas.) = 3.21–3.38 D(calc.) = 3.364

Optical Properties: Transparent to translucent. *Color:* Colorless, pale yellow, pink, red, gray, green; colorless in thin section.
Optical Class: Biaxial (+). *Orientation:* $Y = b$; $X \wedge a = 0°$–$7°$. *Dispersion:* $r < v$.
$\alpha = 1.670$–1.718 $\beta = 1.670$–1.725 $\gamma = 1.690$–1.734 2V(meas.) = 14°–90°

Cell Data: *Space Group:* $P2_1/m$. $a = 8.879(5)$ $b = 5.583(5)$ $c = 10.155(6)$
$\beta = 115.50(5)°$ Z = 2

X-ray Powder Pattern: Vernirovice, Czech Republic. (ICDD 21-128).
2.89 (100), 2.79 (90), 2.59 (70), 2.68 (60), 2.67 (60), 2.40 (60), 2.29 (60)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	40.36	38.01	MgO	0.74	0.01
TiO_2	0.09	trace	CaO	22.62	23.86
Al_2O_3	30.67	31.71	H_2O^+	3.50	1.83
Fe_2O_3	0.61	4.68	H_2O^-	0.00	0.01
FeO	1.77	0.23	Total	100.36	100.34
MnO		trace			

(1) Kälviä, Finland; corresponds to $(Ca_{1.86}Fe^{2+}_{0.11}Mg_{0.08})_{\Sigma=2.05}(Al_{2.78}Fe^{3+}_{0.04})_{\Sigma=2.82}Si_{3.10}O_{12.5}$.
(2) Camaderry Mountain, Ireland; corresponds to $(Ca_{1.96}Fe^{2+}_{0.02})_{\Sigma=1.98}(Al_{2.79}Fe^{3+}_{0.27})_{\Sigma=3.06}(Si_{2.92}Al_{0.08})_{\Sigma=3.00}O_{12.5}(OH)_{0.94}$.

Polymorphism & Series: Dimorphous with zoisite.

Mineral Group: Epidote group.

Occurrence: Typically in low- to medium-grade regionally metamorphosed igneous and sedimentary rocks, as well as in contact metamorphosed calcium-rich sediments; an alteration product of plagioclase feldspars (saussuritization).

Association: Amphiboles, plagioclase, quartz.

Distribution: A widespread mineral. Typical occurrences for good crystals include: at the Goslarwand, near Prägraten, Tirol, Austria. From Vernirovice, Czech Republic. At Kälviä, Finland. From Arendal, Norway. At Camaderry Mountain, Co. Wicklow, Ireland. From Amborompotsy, Madagascar. At Sittampundi, Madras, India. In the USA, from the Belvidere Mountain quarries, Lowell, Orleans Co., Vermont; in northern Spade Spring Canyon, Los Angeles Co., California; in the Nightingale district, Pershing Co., Nevada. In Mexico, from the Juarez district, Baja California, and at Alamos, Sonora. In Canada, from Timmins, Ontario.

Name: For its monoclinic crystallography and relation to *zoisite*.

Type Material: n.d.

References: (1) Dana, E.S. (1899) Dana's system of mineralogy, (6th edition), app. I, 18. (2) Deer, W.A., R.A. Howie, and J. Zussman (1986) Rock-forming minerals, (2nd edition), v. 1B, disilicates and ring silicates, 44–134. (3) Dollase, W. A. (1968) Refinement and comparison of the structures of zoisite and clinozoisite. Amer. Mineral., 53, 1882–1898.

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