

Bearthite

Ca₂Al(PO₄)₂(OH)

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Crystal Data: Monoclinic. *Point Group:* 2/m. Rarely as aggregates of partly euhedral, flat prismatic crystals, to 1 mm; typically as smaller, usually corroded, anhedral grains.

Physical Properties: *Cleavage:* One poor prismatic, possible. *Fracture:* Uneven. Hardness = < 5 D(meas.) = n.d. D(calc.) = 3.25

Optical Properties: Transparent. *Color:* Pale yellow; in transmitted light, colorless, commonly cloudy with inclusions. *Streak:* White.

Optical Class: Biaxial (+). *Orientation:* X = b. *Dispersion:* r < v, distinct. α = 1.660–1.662 β = 1.671–1.672 γ = 1.690–1.696 2V(meas.) = 64°–65°

Cell Data: *Space Group:* P2₁/m. a = 7.231(3) b = 5.734(2) c = 8.263(4) β = 112.57(8)° Z = 2

X-ray Powder Pattern: Stockhorn, Switzerland; calculated due to poor Gandolphi pattern. 3.05 (100), 2.867 (61), 2.568 (39), 2.754 (27), 4.58 (22), 2.634 (21), 2.444 (19)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
P ₂ O ₅	44.32	41.64	45.19	MgO	0.12	1.64	
SiO ₂	0.30	0.26		CaO	33.04	29.32	35.71
Al ₂ O ₃	15.91	13.00	16.23	SrO	3.53	2.30	
La ₂ O ₃	0.03	1.52		F	0.48	0.60	
Ce ₂ O ₃	0.04	3.15		Cl	0.02	0.00	
Nd ₂ O ₃		0.82		H ₂ O			2.87
FeO	0.03	0.19		–O = (F, Cl) ₂	0.20	0.25	
				Total	97.62	94.19	100.00

(1) Stockhorn, Switzerland; by electron microprobe, average of four analyses, (OH)¹⁻ shown present by Raman IR and crystal-structure analysis, added here for charge balance; corresponding to (Ca_{1.87}Sr_{0.11})_{Σ=1.98}(Al_{0.99}Mg_{0.01})_{Σ=1.00}[(P_{1.98}Si_{0.02})_{Σ=2.00}O₄]₂[(OH)_{0.85}F_{0.08}]_{Σ=0.93}. (2) Val Po, Italy; by electron microprobe; corresponding to (Ca_{1.77}Sr_{0.08}Ce_{0.06}La_{0.03}Nd_{0.02})_{Σ=1.96}(Al_{0.86}Mg_{0.14}Fe_{0.01})_{Σ=1.01}[(P_{1.98}Si_{0.02})_{Σ=2.00}O₄]₂[(OH)_{0.79}F_{0.10}]_{Σ=0.89}. (3) Ca₂Al(PO₄)₂(OH).

Mineral Group: Brackebuschite group.

Occurrence: In synmetamorphic quartz segregations and as an accessory mineral in high-pressure metamorphic rocks. Experimental study indicates that the stability of bearthite is restricted to very Ca-poor or P-rich rocks under moderate to high-temperature conditions.

Association: Lazulite, apatite, kyanite, coesite, pyrope, paragonite, muscovite, almandine, rutile, augelite, wardite, goyazite, hydroxylherderite, quartz, albite, talc.

Distribution: Found on the western ridge of the Stockhorn, Zermatt Valley, Valais, Switzerland. In Italy, in the Dora Maira massif, between the Po and Varaita Valleys, Piedmont, and around Passo di Vizze, Alto Adige. In Austria, near the Höllkogel, 12 km south-southwest of Mürzzuschlag, Styria. From the Västana mine, near Näsium, Skåne, Sweden.

Name: Honors Professor Peter Bearth (1902–1989), for his pioneering petrologic studies of the high-pressure terranes of the western Alps.

Type Material: Mineralogic-Petrographic Institute, University of Basel, Basel, Switzerland, PB100f; National School of Mines, Paris, 84DM54, 85DM45, 85DM70; Natural History Museum, Paris, France.

References: (1) Chopin, C., F. Brunet, W. Gebert, O. Medenbach, and E. Tillmanns (1993) Bearthite, Ca₂Al[PO₄]₂(OH), a new mineral from high-pressure terranes of the western Alps. Schweiz. Mineral. Petrog. Mitt., 73, 1–9. (2) (1993) Amer. Mineral., 78, 1314 (abs. ref. 1). (3) Brunet, F. and C. Chopin (1995) Bearthite, Ca₂Al(PO₄)₂OH: stability, thermodynamic properties and phase relations. Contr. Mineral. Petrol., 121, 258–266.

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