

Crandallite

CaAl₃(PO₄)(PO₃OH)(OH)₆

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Crystal Data: Hexagonal. *Point Group:* $\bar{3} 2/m$. As trigonal prismatic crystals, terminated by {0001}, or as pseudocubic rhombohedra, to 1 mm; as rosettes of fibers or spherules and crusts with radial fibrous structure; commonly as colloform to pulverulent crusts, nodular, massive.

Physical Properties: *Cleavage:* Perfect on {0001}. *Tenacity:* Brittle. Hardness = 5
D(meas.) = 2.78–3.04 D(calc.) = 3.00

Optical Properties: Translucent. *Color:* Yellow, white, gray; colorless in thin section.
Streak: White. *Luster:* Vitreous, dull to chalky when massive.
Optical Class: Uniaxial (+). $\omega = 1.613$ – 1.627 $\epsilon = 1.622$ – 1.632

Cell Data: *Space Group:* $R\bar{3}m$. $a = 7.0062(4)$ $c = 16.192(1)$ $Z = 3$

X-ray Powder Pattern: Fairfield, Utah, USA. (ICDD 33-257).
2.938 (100), 2.163 (60), 1.8946 (45), 2.983 (40), 1.7520 (35), 3.503 (25), 1.4285 (25)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SO ₃	3.80			SrO	2.21	10.53	
P ₂ O ₅	27.09	32.64	34.28	H ₂ O ⁺	18.86		
Al ₂ O ₃	38.71	35.15	36.94	H ₂ O ⁻	1.29		
CaO	7.50	7.19	13.55	H ₂ O		14.48	15.23
MgO	0.94			Total	100.40	99.99	100.00

(1) Brooklyn mine, Utah, USA; after deduction of insolubles 35.13% as quartz, barite and sulfides. (2) Alto Benedito pegmatite, Brazil; Ca:Sr = 0.56:0.44. (3) CaAl₃(PO₄)(PO₃OH)(OH)₆.

Mineral Group: Crandallite group.

Occurrence: In weathered phosphatic aluminous sedimentary rocks and carbonatites. In phosphate-rich nodules; from complex granite pegmatites; in amphibolite-grade metaquartzites. An authigenic mineral in anoxic marine sediments or in clay-rich sediment beneath a tropical swamp.

Association: Fluorapatite, hydroxylherderite, quartz.

Distribution: In the USA, in Utah, from the Brooklyn mine, near Silver City, Tintic district, Juab Co., at the Little Green Monster mine, Clay Canyon, about nine km west of Fairfield, and from Amatrice Hill, about 40 km northwest of Fairfield, Utah Co.; in the Palermo #1 and Fletcher mines, near North Groton, Grafton Co., New Hampshire; from near Gore, Frederick Co., Virginia; on Dug Hill, near Avant, Garland Co., Arkansas; in several rock formations in central and northern Florida; from the Everly and Hugo mines, Pennington Co., and in the Tip Top mine, 8.5 km southwest of Custer, Custer Co., South Dakota. In the Alto Benedito pegmatite, 15 km west of Picuí, Paraíba, Brazil. At Blaton, Belgium. From Ronneburg, Thuringia, Germany. In Wheal Jane, Kea, Cornwall, England. At Fort Lismeenagh, Shenagolden, Co. Limerick, Ireland. From the Kovdor massif, Kola Peninsula, Russia. In Australia, in the Iron Monarch quarry, Iron Knob; the Moculta phosphate quarry, northeast of Angaston; and at the Mt. Weld carbonatite, 35 km south of Laverton, South Australia. In the Buranga pegmatite, near Gatumba, Rwanda.

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Type Material: National Museum of Natural History, Washington, D.C., USA, R5641.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 835–837. (2) Blount, A.M. (1974) The crystal structure of crandallite. Amer. Mineral., 59, 41–47. (3) Cassedanne, J.P. and L. Barreto da Silva Nen (1991) Strontian crandallite from the Alto Benedito pegmatite, Paraíba, Brazil. Mineral. Record, 22, 183–185.

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