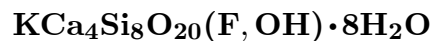


# Fluorapophyllite



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**Crystal Data:** Tetragonal. *Point Group:*  $4/m\ 2/m\ 2/m$ . Crystals tabular to prismatic, to 20 cm, commonly pseudocubic with {100}, {001}, and modified by {111}; prism zone deeply striated || {001}; granular. *Twining:* Rare on {111}.

**Physical Properties:** *Cleavage:* Perfect on {001}, imperfect on {110}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 4.5–5 D(meas.) = 2.33–2.37 D(calc.) = 2.37

**Optical Properties:** Transparent to translucent. *Color:* Colorless, white, pink, pale, yellow, green; in thin section, colorless. *Luster:* Vitreous, pearly on {001}. *Optical Class:* Uniaxial (+). *Dispersion:* High, may be anomalous.  $\omega = 1.530\text{--}1.536$   
 $\epsilon = 1.532\text{--}1.538$

**Cell Data:** *Space Group:*  $P4/mnc$ .  $a = 8.963(2)$   $c = 15.804(2)$   $Z = 2$

**X-ray Powder Pattern:** St. Andreasberg, Germany. (ICDD 19-82). 7.81 (100), 2.49 (90), 3.57 (60), 3.90 (50), 2.95 (50b), 4.51 (45), 3.17 (40)

## Chemistry:

	(1)	(2)
SiO <sub>2</sub>	51.98	52.98
Al <sub>2</sub> O <sub>3</sub>	0.36	
CaO	25.10	24.73
K <sub>2</sub> O	4.45	5.19
Na <sub>2</sub> O	0.61	
F	2.20	2.09
H <sub>2</sub> O	16.25	15.89
–O = F <sub>2</sub>	0.92	0.88
Total	100.03	100.00

(1) Phoenix mine, Keweenaw Co., Michigan, USA; corresponding to  $(\text{K}_{0.85}\text{Na}_{0.16})_{\Sigma=1.01}\text{Ca}_{4.05}(\text{Si}_{7.83}\text{Al}_{0.07})_{\Sigma=7.90}\text{O}_{20}\text{F}_{1.05} \cdot 8.1\text{H}_2\text{O}$ . (2)  $\text{KCa}_4\text{Si}_8\text{O}_{20}\text{F} \cdot 8\text{H}_2\text{O}$ .

**Polymorphism & Series:** Forms a series with hydroxyapophyllite.

**Occurrence:** A secondary mineral in amygdules or druses in basalts; in cavities in granite; in tactite and other metamorphic rocks; a late-stage hydrothermal mineral in some mineral deposits.

**Association:** Zeolites, datolite, pectolite, calcite, quartz.

**Distribution:** Many localities worldwide, but distinction from hydroxyapophyllite requires chemical analysis. Fine specimens with large crystals from the Teigarhorn, Berufjord, Iceland. On the Alpe di Siusi, Trentino-Alto Adige, Italy. At St. Andreasberg, Harz Mountains, Germany. From Korsnäs, Finland. Exceptional groups from India, in the Poona, Nasik, and Bombay districts, Maharashtra. At Shauguang, Guangdong, China. In the USA, from French Creek, Chester Co., and Cornwall, Lebanon Co., Pennsylvania; at Paterson, Passaic Co., and at Bergen Hill, Hudson Co., New Jersey; from the Fairfax quarry, Centreville, Fairfax Co., Virginia. Very large crystals from near Bento Gonçalves, Rio Grande do Sul, Brazil.

**Name:** For the preponderance of *fluorine* in the composition, and *apophyllite*, from the Greek for away *from* and *leaf*, in allusion to its manner of exfoliating on heating.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 566–569. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 3, sheet silicates, 258–266. (3) Colville, A.A., C.P.A. Anderson, and P.M. Black (1971) Refinement of the crystal structure of apophyllite. I. X-ray diffraction and physical properties. *Amer. Mineral.*, 56, 1222–1233. (4) Bartl, H. and G. Pfeifer (1976) Neutronenbeugungsanalyse des Apophyllit  $\text{KCa}_4(\text{Si}_4\text{O}_{10})_2(\text{F}/\text{OH}) \cdot 8\text{H}_2\text{O}$ . *Neues Jahrb. Mineral., Monatsh.*, 58–65 (in German with English abs.). (5) Dunn, P.J. and W.E. Wilson (1978) Nomenclature revisions in the apophyllite group: hydroxyapophyllite, apophyllite, fluorapophyllite. *Mineral. Record*, 3, 95–98.

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