Alforsite $Ba_5(PO_4)_3Cl$

Crystal Data: Hexagonal. *Point Group:* $6/m$. Crystals are subhedral, to 0.2 mm, in very fine-grained masses.

Physical Properties: Hardness = n.d. D(meas.) = n.d. D(calc.) = 4.73–4.80 Intense violet cathodoluminescence.

Optical Properties: Semitransparent. *Color:* Colorless.
Optical Class: Uniaxial (–). $\omega = 1.70(1)$ $\epsilon = 1.70(1)$

Cell Data: *Space Group:* $P6_3/m$ (synthetic). $a = 10.284(2)$ $c = 7.651(3)$ $Z = 2$

X-ray Powder Pattern: Synthetic.
3.06 (100), 2.13 (40), 2.03 (30), 1.928 (30), 1.566 (30), 1.336 (30), 1.077 (30)

Chemistry:

	(1)	(2)	(3)
SiO_2	0.1	< 0.05	
P_2O_5	22.7	21.0	21.14
MnO	< 0.1	< 0.1	
PbO	0.8	< 0.1	
CaO	4.6	0.7	
SrO	2.7	2.0	
BaO	67.7	[71.7	76.13
F	0.7	< 0.1	
Cl	3.6	3.5	3.52
$-O = (F, Cl)_2$	[1.2]	0.8	0.79
Total	[101.7]	[98.1]	100.00

(1) Big Creek, California, USA; by electron microprobe, corresponding to $(Ba_{4.05}Ca_{0.75}Sr_{0.24}Pb_{0.03})_{\Sigma=5.07}[(PO_4)_{2.94}(SiO_4)_{0.01}]_{\Sigma=2.95}(Cl_{0.93}F_{0.14})_{\Sigma=1.07}$. (2) Incline, California, USA; by electron microprobe, Ba by difference, originally given as > 1.3%; corresponding to $(Ba_{4.68}Sr_{0.19}Ca_{0.13})_{\Sigma=5.00}[(PO_4)_{2.98}(SiO_4)_{0.01}]_{\Sigma=2.99}(Cl_{0.99}F_{0.05})_{\Sigma=1.04}$. (3) $Ba_5(PO_4)_3Cl$.

Mineral Group: Apatite group.

Occurrence: In lenses and bands of barium silicate metasediments developed under hornblende-pyroxene hornfels facies near the contact with granite or granodiorite.

Association: Celsian, witherite, sanbornite, gillespite, fresnoite, fluorapatite, walstromite, titantaramellite, quartz, tourmaline, pyrite.

Distribution: From Big Creek and Rush Creek, Fresno Co., and on Trumbull Peak, near Incline, Mariposa Co., California, USA. From the La Madrelena mine, Tres Pozos, Baja California, Mexico.

Name: To honor Dr. John T. Alfors (1930–), geologist, California Division of Mines, for his work on the type locality.

Type Material: National Museum of Natural History, Washington, D.C., USA, 147511.

References: (1) Newberry, N.G., E.J. Essene, and D.R. Peacor (1981) Alforsite, a new member of the apatite group: the barium analogue of chlorapatite. Amer. Mineral., 66, 1050–1053.
(2) Hata, M., F. Marumo, S. Iwai, and H. Aoki (1979) Structure of barium chlorapatite. Acta Cryst., 35, 2382–2384.