Bultfonteinite $Ca_2SiO_2(OH,F)_4$

Crystal Data: Triclinic. *Point Group:* $\overline{1}$. As radiating prismatic acicular crystals and radial spherules, to 2 cm. *Twinning:* Interpenetrating on {100} and {010}; polysynthetic.

Physical Properties: *Cleavage:* Good on {100} and {010}. *Fracture:* Conchoidal. Hardness = 4.5 D(meas.) = 2.73 D(calc.) = 2.74

Optical Properties: Transparent. *Color:* Pale pink to colorless. *Luster:* Vitreous. *Optical Class:* Biaxial (+). *Orientation:* $Z' \wedge c = 27°–29°$ on {010}; $Z' \wedge c = 46°–48°$ on {100}. *Dispersion:* $r > v$, barely perceptible. $\alpha = 1.587(2)$ $\beta = [1.590]$ $\gamma = 1.597(2)$ 2V(meas.) = 70°

Cell Data: *Space Group:* $P\overline{1}$. $a = 10.992(4)$ $b = 8.185(2)$ $c = 5.671(1)$ $\alpha = 93°57'$ $\beta = 90°19'$ $\gamma = 89°51'$ Z = 4

X-ray Powder Pattern: Bultfontein mine, Kimberley, South Africa.
1.93 (100), 8.12 (60), 2.92 (60), 2.88 (60), 2.037 (50), 4.06 (40), 3.50 (40)

Chemistry:

	(1)	(2)
SiO_2	26.50	24.06
B_2O_3		0.02
Al_2O_3	0.72	1.37
CaO	54.20	53.59
Na_2O		0.04
F	8.81	7.90
H_2O^+		10.78
H_2O^-		0.75
H_2O	13.36	
CO_2		4.65
P_2O_5		0.02
$-O = F_2$	3.71	3.33
Total	99.88	99.85

(1) Bultfontein mine, Kimberley, South Africa. (2) Fuka, Japan; corresponds to $(Ca_{2.04}(Si_{0.96}Al_{0.06})_{\Sigma=1.02}O_{2.13}[(OH)_{2.87}F_{1.00}]_{\Sigma=3.87}$.

Occurrence: In a large "horse" of diabase and shale fragments in a kimberlite pipe (Bultfontein mine, Kimberley, South Africa); in a contact zone in thermally metamorphosed limestone (Crestmore, California, USA).

Association: Calcite, apophyllite, natrolite (Bultfontein mine, Kimberley, South Africa); afwillite, scawtite (Crestmore, California, USA); oyelite, scawtite, xonotlite (Fuka, Japan).

Distribution: In South Africa, in Cape Province, in the Bultfontein and Dutoitspan diamond mines, Kimberley; the Jagersfontein diamond mine, Orange River Colony; and the N'Chwaning and Wessels manganese mines, near Kuruman. In the USA, at Crestmore, Riverside Co., California. In the Hatrurim Formation, Israel. In Japan, from Fuka, near Bicchu, and in the Mihara mine, Okayama Prefecture.

Name: For the Bultfontein mine, Kimberley, South Africa, where it was first discovered.

Type Material: Cambridge University, Cambridge; The Natural History Museum, London, England, 1928,78.

References: (1) Parry, J., A.F. Williams, and F.E. Wright (1932) On bultfonteinite, a new fluorine-bearing hydrous calcium silicate from South Africa. Mineral. Mag., 23, 145–162. (2) (1933) Amer. Mineral., 18, 32 (abs. ref. 1). (3) McIver, E.J. (1963) The structure of bultfonteinite, $Ca_4Si_2O_{10}F_2H_6$. Acta Cryst., 16, 551–558. (4) Kusachi, I., C. Henmi, and K. Henmi (1984) An oyelite-bearing vein at Fuka, the town of Bitchu, Okayama Prefecture, Japan. J. Japan. Assoc. Mineral. Petrol. Econ. Geol., 79, 267–275.