Fluoborite $Mg_3(BO_3)(F,OH)_3$

Crystal Data: Hexagonal. *Point Group:* $6/m$. As acicular to prismatic crystals with pyramidal terminations, which may be poorly formed, to 2 cm; in fanlike or stellate aggregates.

Physical Properties: *Cleavage:* On {0001}, good. Hardness = ∼3.5 D(meas.) = 2.98 D(calc.) = [2.92] Strong cream-white fluorescence under SW UV.

Optical Properties: Translucent to transparent. *Color:* Colorless to white; colorless in transmitted light.
Optical Class: Uniaxial (–). ω = 1.510–1.530 (smaller values for F-rich compositions).
ϵ = 1.486–1.507

Cell Data: *Space Group:* $P6_3/m$. $a = 8.8612(12)$ $c = 3.1021(6)$ Z = 3

X-ray Powder Pattern: Crestmore quarry, California, USA.
2.424 (s), 4.462 (ms), 2.143 (ms), 2.129 (ms), 7.72 (m), 2.575 (m), 1.815 (m)

Chemistry:

	(1)		(1)
B_2O_3	18.24	MgO	65.08
SiO_2	0.04	CaO	0.10
TiO_2	0.02	F	23.30
Al_2O_3	0.01	Cl	0.03
Cr_2O_3	0.02	H_2O	3.40
FeO	0.16	$-O = (F,Cl)_2$	9.81
MnO	0.00	Total	100.59

(1) Huerta del Vinagre mine, Spain; by electron microprobe, corresponding to $Mg_{3.02}(BO_3)_{0.98}(F_{2.29}OH_{0.71})_{\Sigma=3.00}$.

Occurrence: A rare hydrothermal mineral in skarns developed in metamorphosed boron-rich magnesian rocks.

Association: Ludwigite, chondrodite, magnetite, calcite (Tallgruvan, Sweden); mooreite, willemite, fluorite, hydrozincite, pyrochroite, zincite, rhodochrosite (Sterling Hill, New Jersey, USA).

Distribution: From Tallgruvan, east of Kallmora, Norberg, Sweden. In the USA, around Edenville and Amity, Orange Co., New York; in New Jersey, from Sterling Hill, Ogdensburg, in the Limecrest quarry, Sparta, and at the Edison quarry, Rudeville, Sussex Co.; from near Blind Mountain, Bristol district, Lincoln Co., Nevada; in the Crestmore quarry, Riverside Co., California. Large crystals from the Cardiff mine and several roadcuts in the vicinity of Wilberforce, Ontario, Canada. At Broadford, Skye, Inverness-shire, Scotland. Abundant at the St. Dizier tin deposit, 20 km northwest of Zeehan, Tasmania, Australia. At the Hol Kol Au–Cu mine, about 75 km southeast of Pyongyang, Suan Co., North Korea. From the Palabora mine, Transvaal, South Africa.

Name: For the essential chemical components, FLUOrine and BORon.

Type Material: Swedish Museum of Natural History, Stockholm, Sweden.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 369–370. (2) Ottolini, L., F. Cámara, and S. Bigi (2000) An investigation of matrix effects in the analysis of fluorine in humite-group minerals by EPMA, SIMS, and SREF. Amer. Mineral., 85, 89–102. (3) Cámara, F. and L. Ottolini (2000) New data on the crystal-chemistry of fluoborite by means of SREF, SIMS, and EMP analysis. Amer. Mineral., 85, 103–107. (4) Segnit, E.R. and C.J. Lancucki (1963) Fluoborite from Crestmore, California. Amer. Mineral., 48, 678–683.