Fluor-dravite $NaMg_3Al_6Si_6O_{18}(BO_3)_3(OH)_3F$

Crystal Data: Hexagonal. *Point Group*: 3*m*. As irregular grains to a few mm.

Physical Properties: *Cleavage*: None. *Fracture*: Conchoidal. *Tenacity*: Brittle. Hardness = 7 D(meas.) = n.d. D(calc.) = 3.120

Optical Properties: Transparent. *Color*: Blackish brown. *Streak*: Pale brown. *Luster*: Vitreous. *Optical Class*: Uniaxial (-). ω = 1.645(2) ε = 1.621(2) *Pleochroism*: *O* = pale yellow-brown; *E* = colorless.

Cell Data: *Space Group*: *R*3*m*. *a* = 15.955(3) *c* = 7.153(2) Z = 3

X-ray Powder Pattern: Crabtree emerald mine, Mitchell County, North Carolina, USA. 3.475 (100), 2.583 (67), 2.961 (60), 1.920 (27), 3.998 (22), 6.375 (19), 2.043 (19)

Chemistry:	(1)	(2)		(1)	(2)
SiO_2	36.02	36.35	Na_2O	2.80	6.25
Al_2O_3	31.69	30.84	TiO_2	0.25	
FeO	6.41		F	1.45	1.92
MnO	0.67		B_2O_3	[10.91]	10.53
ZnO	0.05		Li_2O	[0.19]	1.92
CaO	0.25		H_2O	[3.19]	2.73
MgO	7.71	12.19	$- O = F_2$	0.61	0.81
			Total	101.00	100.00

(1) Crabtree emerald mine, Mitchell County, North Carolina, USA; average of 10 electron microprobe analyses supplemented by Mössbauer spectrometry, H determined by SIMS, B_2O_3 calculated from structure, Li derived by SREF; corresponds to $^{X}(Na_{0.88}Ca_{0.04})_{\Sigma=0.92}{}^{Y}(Mg_{1.87}Fe_{0.87}Mn_{0.09}Zn_{0.01}Ti_{0.03}Li_{0.13})_{\Sigma=3.01}{}^{Z}Al_6{}^{T}(Si_{5.87}B_{0.05}Al_{0.08})O_{18}{}^{B}(BO_3)_3{}^{V}(OH)_3{}^{W}[F_{0.75}(OH)_{0.47}]_{\Sigma=1.22}$.
(2) $NaMg_3Al_6Si_6O_{18}(BO_3)_3(OH)_3F$.

Polymorphism & Series: Solid-solution exists with fluor-schorl.

Mineral Group: Tourmaline supergroup, alkali group, subgroup 1.

Occurrence: Formed near the contact between a granitic pegmatite and country rock.

Association: K-feldspar, plagioclase, quartz, beryl, muscovite, garnet, biotite, fluorite.

Distribution: From the Crabtree emerald mine, Mitchell County, North Carolina, USA.

Name: As a *dravite* with dominant *fluor*ine in the W site.

Type Material: National Museum of Natural History, Washington, D.C., USA (121341).

References: (1) Clark, C.M., F.C. Hawthorne, and L. Ottolini (2011) Fluor-dravite, $NaMg_3Al_6Si_6O_{18}(BO_3)_3(OH)_3F$, a new mineral species of the tourmaline group from the Crabtree emerald mine, Mitchell County, North Carolina: Description and crystal structure. Can. Mineral., 49, 57-62. (2) (2012) Amer. Mineral., 98, 2067 (abs. ref. 1).