Fredrikssonite $Mg_2(Mn^{3+},Fe^{3+})BO_5$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. As crystals, prismatic and striated along [001], sharp to rounded, to 2.0 mm, with diamond-shaped cross-sections; in parallel to randomly oriented aggregates.

Physical Properties: *Cleavage:* One, poor, and a second, very poor. *Fracture:* Irregular to uneven. *Tenacity:* Brittle. Hardness = ∼6 D(meas.) = 3.84(5) D(calc.) = 3.80

Optical Properties: Nearly opaque to translucent. *Color:* Medium reddish brown. *Streak:* Pale brown to yellow. *Luster:* Vitreous to dull. *Optical Class:* Biaxial (+). *Pleochroism:* Pronounced; X = golden brown; Z = dark reddish brown to black. *Orientation:* Z = elongation of cleavage fragments = c (by analogy to ludwigite). *Dispersion:* $r > v$, strong. *Absorption:* $Z > X$. $\alpha = 1.82(2)$ $\beta = < 1.86$ $\gamma = \sim 1.99$ $2V(meas.) = > 60°$

Cell Data: *Space Group: Pbam.* $a = 9.198(2)$ $b = 12.528(3)$ $c = 2.965(1)$ $Z = 4$

X-ray Powder Pattern: Långban, Sweden.
2.590 (100), 2.486 (90), 5.16 (80), 2.013 (50), 1.513 (40), 2.201 (30), 1.570 (30)

Chemistry:

	(1)
B_2O_3	[17.9]
Al_2O_3	1.9
Fe_2O_3	5.4
Mn_2O_3	35.5
MnO	0.0
MgO	40.3
Total	[101.0]

(1) Långban, Sweden; by electron microprobe, B_2O_3 calculated from stoichiometry and by analogy to orthopinakiolite; corresponds to $Mg_{1.93}(Mn^{3+}_{0.87}Fe^{3+}_{0.13}Al_{0.07})_{\Sigma=1.07}B_{0.99}O_{5.05}$.

Polymorphism & Series: Polymorphous with orthopinakiolite, pinakiolite, takéuchiite.

Mineral Group: Ludwigite group.

Occurrence: From a metamorphosed Fe–Mn orebody.

Association: Hausmannite, manganoan calcite, brucite, adelite, dolomite–kutnohorite, clinohumite, jacobsite.

Distribution: From Långban, Värmland, Sweden.

Name: Honors Dr. Kurt A. Fredriksson (1926–), Swedish–American geochemist and meteoriticist, Smithsonian Institution, Washington, D.C., USA.

Type Material: National Museum of Natural History, Washington, D.C., USA, 149811, 150341.

References: (1) Dunn, P.J., D.R. Peacor, W.B. Simmons, and D. Newbury (1983) Fredrikssonite, a new member of the pinakiolite group, from Långban, Sweden. Geol. Fören. Förhandl. Stockholm, 150, 335–340. (2) (1986) Amer. Mineral., 71, 227 (abs. ref. 1). (3) Burns, P.C., M.A. Cooper, and F.C. Hawthorne (1994) Jahn-Teller-distorted $Mn^{3+}O_6$ octahedra in fredrikssonite, the fourth polymorph of $Mg_2Mn^{3+}(BO_3)O_2$. Can. Mineral., 32, 397–403.