Filipstadite $(Mn^{2+},Mg)_4Sb^{5+}Fe^{3+}O_8$

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Crystal Data: Orthorhombic, pseudocubic. *Point Group:* n.d. As pseudo-octahedral crystals, to 200 μm, modified by pseudododecahedral and pseudocube faces; as overgrowths on jacobsite or hausmannite. *Twinning:* Poorly developed sector twinning evident in reflected light.

Physical Properties: *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = n.d. VHN = 792–882, 831 average (100 g load). D(meas.) = n.d. D(calc.) = 4.9

Optical Properties: Opaque. *Color:* Black; gray in reflected light, with amber-orange, brown, or red internal reflections. *Streak:* Brown. *Luster:* Metallic.
Optical Class: Biaxial. *Dispersion:* $r < v$, slight. *Anisotropism:* Weak; in shades of dark brownish gray.
R: (400) 12.8, (420) 12.5, (440) 12.4, (460) 12.2, (480) 12.0, (500) 11.9, (520) 11.8, (540) 11.7, (560) 11.6, (580) 11.6, (600) 11.6, (620) 11.6, (640) 11.5, (660) 11.5, (680) 11.4, (700) 11.4

Cell Data: *Space Group:* n.d. $a = 36.7$ $b = 36.7$ $c = 25.9$ Z = [216]

X-ray Powder Pattern: Långban, Sweden.
2.56 (100), 1.527 (70), 1.662 (60), 2.157 (40), 3.05 (30), 1.1251 (30), 4.97 (20)

Chemistry:

	(1)	(2)
SiO_2	0.3	0.2 – 0.4
TiO_2		0.1 – 0.2
Al_2O_3	0.7	0.2 – 0.3
Fe_2O_3	14.9	12.6 – 15.1
Sb_2O_3	34.3	24.6 – 27.4
MnO	36.8	46.8 – 48.6
ZnO		1.9 – 2.1
MgO	12.4	7.8 – 8.0
Total	99.4	

(1) Långban, Sweden; by electron microprobe, average of five analyses, total Fe as Fe^{3+}, total Mn as MnO; corresponding to $(Mn_{2.48}Mg_{1.48})_{\Sigma=3.96}Fe_{0.90}Sb^{5+}_{1.02}Al_{0.06}Si_{0.02}O_8$. (2) Jakobsberg, Sweden; by electron microprobe, ranges of seven analyses on two grains, total Fe as FeO, Mn^{2+}:Mn^{3+} from charge balance; the average corresponding to $Mn^{2+}_{2.56}Mg_{0.94}Sb^{5+}_{0.80}Fe^{3+}_{0.82}Mn^{3+}_{0.70}Zn_{0.12}Al_{0.02}Ti_{0.02}Si_{0.02}O_8$.

Occurrence: In metamorphosed Fe–Mn orebodies.

Association: Jacobsite, ingersonite, calcite, antimony (Långban, Sweden); hausmannite, forsterite, phlogopite, calcite, copper, hedyphane, svabite (Jakobsberg, Sweden).

Distribution: From Långban and Jakobsberg, Värmland, Sweden.

Name: For the town of Filipstad, Sweden, which is near the Långban mine.

Type Material: The Natural History Museum, London, England, 1986,410, E1177; National Museum of Natural History, Washington, D.C., USA, 163012.

References: (1) Dunn, P.J., D.R. Peacor, A.J. Criddle, and C.J. Stanley (1988) Filipstadite, a new Mn−Fe^{3+}−Sb derivative of spinel, from Långban, Sweden. Amer. Mineral., 73, 413–419. (2) Holtstam, D. (1993) A second occurrence of filipstadite in Värmland, Sweden. Geol. Fören. Förhandl. Stockholm, 115, 239–240.

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