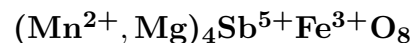


# Filipstadite



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**Crystal Data:** Orthorhombic, pseudocubic. *Point Group:* n.d. As pseudo-octahedral crystals, to 200  $\mu\text{m}$ , modified by pseudododecahedral and pseudocube faces; as overgrowths on jacobsonite 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 <sub>2</sub>               | 0.3  | 0.2 – 0.4   |
| TiO <sub>2</sub>               |      | 0.1 – 0.2   |
| Al <sub>2</sub> O <sub>3</sub> | 0.7  | 0.2 – 0.3   |
| Fe <sub>2</sub> O <sub>3</sub> | 14.9 | 12.6 – 15.1 |
| Sb <sub>2</sub> O <sub>3</sub> | 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<sup>3+</sup>, total Mn as MnO; corresponding to  $(\text{Mn}_{2.48}\text{Mg}_{1.48})_{\Sigma=3.96}\text{Fe}_{0.90}\text{Sb}_{1.02}^{5+}\text{Al}_{0.06}\text{Si}_{0.02}\text{O}_8$ . (2) Jakobsberg, Sweden; by electron microprobe, ranges of seven analyses on two grains, total Fe as FeO, Mn<sup>2+</sup>:Mn<sup>3+</sup> from charge balance; the average corresponding to  $\text{Mn}_{2.56}^{2+}\text{Mg}_{0.94}\text{Sb}_{0.80}^{5+}\text{Fe}_{0.82}^{3+}\text{Mn}_{0.70}^{3+}\text{Zn}_{0.12}\text{Al}_{0.02}\text{Ti}_{0.02}\text{Si}_{0.02}\text{O}_8$ .

**Occurrence:** In metamorphosed Fe–Mn orebodies.

**Association:** Jacobsonite, 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<sup>3+</sup>–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.