

**Fersmanite****(Ca, Na)<sub>4</sub>(Ti, Nb)<sub>2</sub>Si<sub>2</sub>O<sub>11</sub>(F, OH)<sub>2</sub>**

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**Crystal Data:** Triclinic, pseudotetragonal. *Point Group:*  $\bar{1}$  or 1. Crystals commonly distorted, flattened, pseudotetragonal, to 2 cm. *Twining:* Possibly on {001}.

**Physical Properties:** *Fracture:* Uneven. Hardness = 5–5.5 D(meas.) = 3.44–3.46 D(calc.) = [3.43]

**Optical Properties:** Transparent to translucent. *Color:* Dark brown to golden yellow. *Streak:* White with pale brownish tint. *Luster:* Vitreous. *Optical Class:* Biaxial (-).  $\alpha = 1.873\text{--}1.886$   $\beta = 1.930$   $\gamma = 1.914\text{--}1.939$   $2V(\text{meas.}) = 0^\circ\text{--}7^\circ$

**Cell Data:** *Space Group:*  $P\bar{1}$  or  $P1$ .  $a = 7.210(1)$   $b = 7.213(2)$   $c = 20.451(3)$   
 $\alpha = 95.15(3)^\circ$   $\beta = 95.60(2)^\circ$   $\gamma = 89.04(5)^\circ$   $Z = [8]$

**X-ray Powder Pattern:** Khibiny massif, Russia.  
 3.058 (100), 2.815 (60), 1.518 (55), 1.801 (50), 1.687 (45), 1.552 (40), 2.530 (35)

**Chemistry:**

	(1)
SiO <sub>2</sub>	22.46
TiO <sub>2</sub>	17.08
Nb <sub>2</sub> O <sub>5</sub>	21.79
CaO	28.80
Na <sub>2</sub> O	6.92
F	4.23
-O = F <sub>2</sub>	1.78
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Total	99.50

(1) Khibiny massif, Russia; by electron microprobe, average of several analyses, H<sub>2</sub>O in empirical analysis to sum to 13 cations; corresponds to (Ca<sub>2.82</sub>Na<sub>1.21</sub>) $\Sigma=4.03$ (Ti<sub>1.18</sub>Nb<sub>0.86</sub>) $\Sigma=2.04$ Si<sub>2</sub>O<sub>10.89</sub>[F<sub>1.15</sub>(OH)<sub>0.96</sub>] $\Sigma=2.11$ .

**Occurrence:** In aegirine-rich nepheline pegmatites in a differentiated alkalic massif (Khibiny massif, Russia).

**Association:** Feldspar, pectolite, apatite, aegirine, lamprophyllite, rinkite, sulfides.

**Distribution:** On Mt. Eveslogchorr, Khibiny massif, Kola Peninsula, Russia. From Üdersdorf, Eifel district, Germany.

**Name:** For Academician Aleksandr Evgen'evich Fersman (1883–1945), eminent Russian mineralogist, geochemist, and gemologist.

**Type Material:** A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 33193, 33194.

**References:** (1) Labuntsov, A.N. (1929) La fersmanite – un nouveau minéral des Monts Chibines [Khibiny massif]. Doklady Acad. Nauk SSSR, 12, 297–301 (in French). (2) (1931) Amer. Mineral., 16, 92 (abs. ref. 1). (3) Machin, M.P. (1977) Fersmanite, (Ca, Na)<sub>4</sub>(Ti, Nb)<sub>2</sub>Si<sub>2</sub>O(F, OH)<sub>2</sub>: a restudy. Can. Mineral., 15, 87–91. (4) Saf'yanov, Y.N., R.I. Bochkova, and V.V. Ilyukhin (1984) The crystal structure of fersmanite. Kristallografiya (Sov. Phys. Crystal.), 29, 56–59 (in Russian). (5) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 564–566.