

**Crystal Data:** Monoclinic. *Point Group:* 2/m. Crystals tabular, flattened on {100}, elongated along [010], showing {100}, {001}, {011}, may be fan-shaped, to 18 cm. *Twinning:* On {100}, twin and composition plane, polysynthetic, common.

**Physical Properties:** *Cleavage:* Good on {10 $\bar{1}$ }. Hardness = 5 D(meas.) = 3.245 D(calc.) = 3.242

**Optical Properties:** Transparent, translucent if clouded by inclusions. *Color:* Gray to white; colorless in thin section. *Luster:* Vitreous.

*Optical Class:* Biaxial (-). *Orientation:* Y = b; X  $\wedge$  c = 24°.  $\alpha$  = 1.532–1.557  $\beta$  = 1.544–1.565  $\gamma$  = 1.551–1.571 2V(meas.) = 75°–81° 2V(calc.) = 74°–81°

**Cell Data:** *Space Group:* P2<sub>1</sub>/m. a = 6.836–6.865 b = 7.151–7.225 c = 5.457–5.522  $\beta$  = 109°00'–109°36' Z = 2

**X-ray Powder Pattern:** Viitaniemi pegmatite, Finland.

2.883 (100), 2.937 (56), 3.223 (46), 2.160 (40), 2.569 (35), 4.885 (33), 1.915 (28)

Chemistry:	(1)	(2)	(1)	(2)
P <sub>2</sub> O <sub>5</sub>	28.3	28.1	K <sub>2</sub> O	0.27
Al <sub>2</sub> O <sub>3</sub>	22.4	23.4	Li <sub>2</sub> O	0.00
FeO	0.70	0.0	F	12.3
MnO	10.5	0.0	H <sub>2</sub> O <sup>+</sup>	4.9
MgO	0.38	0.1	H <sub>2</sub> O <sup>-</sup>	0.03
CaO	14.7	22.3	-O = F <sub>2</sub>	5.14
Na <sub>2</sub> O	11.6	11.4		6.1
			Total	100.84
				93.7

(1) Viitaniemi pegmatite, Finland; by AA, Mn and P colorimetrically, F by ion-active electrode, H<sub>2</sub>O by the Penfield method; corresponds to (Na<sub>0.91</sub>K<sub>0.01</sub>) $\Sigma=0.92$ (Ca<sub>0.64</sub>Mn<sub>0.36</sub><sup>2+</sup>Fe<sub>0.02</sub><sup>2+</sup>Mg<sub>0.02</sub>) $\Sigma=1.04$ Al<sub>1.07</sub>P<sub>0.97</sub>O<sub>4.11</sub>[(F<sub>1.57</sub>(OH)<sub>1.33</sub>] $\Sigma=2.90$ . (2) Francon quarry, Canada; by electron microprobe, corresponding to Na<sub>0.91</sub>(Ca<sub>0.98</sub>Mg<sub>0.01</sub>) $\Sigma=0.99$ Al<sub>1.13</sub>(P<sub>0.98</sub>O<sub>4</sub>)(F, OH)<sub>3</sub>.

**Occurrence:** An inclusion in eosphorite and rimming morinite, from a complex zoned granite pegmatite (Viitaniemi pegmatite, Finland); in druses in granite (Greifensteine, Germany).

**Association:** Eosphorite, fluorapatite, crandallite, montebasite, morinite (Viitaniemi pegmatite, Finland); lacroixite, morinite, apatite, childrenite, roscherite, tourmaline (Greifensteine, Germany); cryolite, fluorite, weloganite, dresserite, dawsonite, calcite, pyrite, galena, sphalerite, quartz (Francon quarry, Canada).

**Distribution:** In the Viitaniemi pegmatite, near Eräjärvi, Finland. On the Greifensteine, near Ehrenfriedersdorf, Saxony, Germany. In the Francon quarry, Montreal Island, Montreal, Quebec, Canada. Large crystals from near Dassu, Braldu Valley, Pakistan.

**Name:** For its occurrence in the Viitaniemi pegmatite, Finland.

**Type Material:** Mineralogical Museum, Geological Survey of Finland, Helsinki, Finland.

**References:** (1) Lahti, S.I. (1981) The granite pegmatites of the Eräjärvi area in Orivesi, southern Finland. Geol. Surv. Finland Bull. 314, 82 pp, esp. 51–56. (2) (1981) Amer. Mineral., 66, 1102 (abs. ref. 1). (3) Ramik, R.A., B.D. Sturman, A.C. Roberts, and P.J. Dunn (1983) Viitaniemiite from the Francon quarry, Montreal, Quebec. Can. Mineral., 21, 499–502. (4) Pajunen, A. and S.I. Lahti (1984) The crystal structure of viitaniemiite. Amer. Mineral., 69, 961–966.