Viitaniemiite \( \text{Na(Ca}_{0.64}\text{Mn}^{2+}_{0.36})\text{Al(PO}_{4}\text{)}(\text{F, OH})_{3} \)

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\}. 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: \( Y = b; X \wedge c = 24^\circ \). \( \alpha = 1.532–1.557 \), \( \beta = 1.544–1.565 \), \( \gamma = 1.551–1.571 \). 2V(meas.) = 75°–81° 2V(calc.) = 74°–81°

Cell Data: Space Group: \( P2_1/m \). \( a = 6.836–6.865 \), \( b = 7.151–7.225 \), \( c = 5.457–5.522 \), \( \beta = 109^\circ00'–109^\circ36' \). \( Z = 2 \)

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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)
\[
\begin{array}{cccc}
P_2O_5 & 28.3 & 28.1 & K_2O 0.27 & 0.0 \\
Al_2O_3 & 22.4 & 23.4 & Li_2O 0.00 & \\
FeO & 0.70 & 0.0 & F & 12.3 \\
MnO & 10.5 & 0.0 & H_2O^+ & 4.9 \\
MgO & 0.38 & 0.1 & H_2O^- & 0.03 \\
CaO & 14.7 & 22.3 & O = F_2 & 5.14 \\
Na_2O & 11.6 & 11.4 & Total 100.84 & 93.7 \\
\end{array}
\]

(1) Viitaniemi pegmatite, Finland; by AA, Mn and P colorimetrically, F by ion-active electrode, H_2O by the Penfield method; corresponds to \( \text{Na}_{0.91}\text{K}_{0.01})_{\Sigma=0.92}\text{Ca}_{0.64}\text{Mn}^{2+}_{0.36}\text{Fe}^{2+}_{0.02}\text{Mg}_{0.02})_{\Sigma=1.04}\text{Al}_{1.07}\text{P}_{0.97}\text{O}_{4.11}[(\text{F})_{1.57}\text{OH})_{1.33}]_{\Sigma=2.90} \)

(2) Francon quarry, Canada; by electron microprobe, corresponding to \( \text{Na}_{0.91}\text{Ca}_{0.98}\text{Mg}_{0.01})_{\Sigma=0.99}\text{Al}_{1.13}(\text{F})_{0.98}\text{O}_{4})[(\text{F, OH})_{3} \)

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, montebrasite, morinite (Viitaniemi pegmatite, Finland); lacroixite, 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.