

**Crystal Data:** Triclinic. [Point Group: 1 or  $\bar{1}$ ] (by analogy to innelite). As lath-shaped, split, and distorted crystals, to 6 mm, exhibiting prominent {010}, striations parallel to elongation; typically as bunch-, sheaf-, and rosettelike aggregates.

**Physical Properties:** *Cleavage:* Perfect on {010}, good on {100}. *Tenacity:* Brittle. *Fracture:* Stepped. Hardness = 4.5-5.  $D(\text{meas.}) = 3.82(5)$   $D(\text{calc.}) = 3.92$

**Optical Properties:** Transparent. *Color:* Yellow-brown, honey, occasionally brown. *Streak:* Pale yellow. *Luster:* Vitreous, greasy on broken surfaces. *Optical Class:* Biaxial (+).  $\alpha = 1.730(5)$   $\beta = 1.745(3)$   $\gamma = 1.764(3)$   $2V(\text{meas.}) = \sim 90^\circ$   $2V(\text{calc.}) = 84^\circ$  *Orientation:*  $Z \wedge c \sim 5^\circ$ .

**Cell Data:** [Space Group:  $P\bar{1}$  or  $P1$ ] (by analogy to innelite).  $a = 5.38(2)$   $b = 7.10(2)$   $c = 14.76(5)$   $\alpha = 99.00(7)^\circ$   $\beta = 94.94(6)^\circ$   $\gamma = 90.14(8)^\circ$   $Z = 1$

**X-ray Powder Pattern:** Kovdor massif, Kola Peninsula, Russia (identical to innelite). 14.5 (100), 2.683 (90), 2.133 (80), 3.455 (40), 2.810 (40), 2.059 (40), 3.382 (35)

Chemistry:	(1)		(1)
Na <sub>2</sub> O	6.06	SiO <sub>2</sub>	17.83
K <sub>2</sub> O	0.04	TiO <sub>2</sub>	16.88
CaO	0.15	Nb <sub>2</sub> O <sub>5</sub>	0.74
SrO	0.99	P <sub>2</sub> O <sub>5</sub>	5.93
BaO	41.60	SO <sub>3</sub>	5.29
MnO	1.07	F	0.14
Fe <sub>2</sub> O <sub>3</sub>	1.55	<u>-O=F<sub>2</sub></u>	<u>0.06</u>
Al <sub>2</sub> O <sub>3</sub>	0.27	Total	99.12

(1) Kovdor massif, Kola Peninsula, Russia; average of 14 electron microprobe analyses, absence of OH, H<sub>2</sub>O confirmed by IR, corresponding to

$(\text{Ba}_{3.59}\text{Sr}_{0.13}\text{K}_{0.01})_{\Sigma=3.73}(\text{Na}_{2.59}\text{Mg}_{0.21}\text{Mn}_{0.20}\text{Ca}_{0.04})_{\Sigma=3.04}(\text{Ti}_{2.80}\text{Fe}^{3+}_{0.26}\text{Nb}_{0.07})_{\Sigma=3.13}(\text{Si}_{3.93}\text{Al}_{0.07})_{\Sigma=4}\text{O}_{14}[(\text{P}_{1.11}\text{S}_{0.87})_{\Sigma=1.98}\text{O}_{7.96}](\text{O}_{2.975}\text{F}_{0.10})_{\Sigma=3.075}$ .

**Polymorphism & Series:** Forms a series with innelite.

**Occurrence:** A late stage mineral in a hydrothermally altered peralkaline pegmatite that crosscuts calcite carbonatite associated with an ultramafic alkaline pluton.

**Association:** Thompsonite-Ca, golshevite, pectolite, cancrinite, pyroxene, CO<sub>3</sub>-bearing fluorapatite.

**Distribution:** Kovdor massif, Kola Peninsula, Russia.

**Name:** For its chemical composition as the P-analog of innelite.

**Type Material:** A.E. Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, 3288/1.

**References:** (1) Pekov, I.V., N.V. Chukanov, I.M. Kulikova, and D.I. Belakovsky (2006) Phosphoinnelite,  $\text{Ba}_4\text{Na}_3\text{Ti}_3\text{Si}_4\text{O}_{14}(\text{PO}_4, \text{SO}_4)_2(\text{O}, \text{F})_3$ , a new mineral from peralkaline pegmatites of the Kovdor massif, Kola Peninsula. Zap. Ross. Mineral. Obshch., 135(3), 52-60 (in Russian, English abstract); (2007) Geology of Ore Deposits, 49, 530-536 (in English). (2) (2009) Amer. Mineral., 94, 1081 (abs. ref. 1).