

Tiptopite

$\text{K}_2(\text{Li, Na, Ca})_6\text{Be}_6(\text{PO}_4)_6(\text{OH})_2 \cdot \text{H}_2\text{O}$

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Crystal Data: Hexagonal. *Point Group:* 6. Crystals are acicular hexagonal prisms, to 5 mm, terminated by {0001}, which may contain cavernous tubes, aggregated into radial sprays and divergent bundles.

Physical Properties: *Fracture:* Uneven. *Tenacity:* Brittle. *Hardness* = n.d.
D(meas.) = 2.65(2) D(calc.) = 2.52

Optical Properties: Transparent. *Color:* Colorless. *Luster:* Vitreous.
Optical Class: Uniaxial (+). $\omega = 1.551(1)$ $\epsilon = 1.559(1)$

Cell Data: *Space Group:* $P6_3$. $a = 11.655(5)$ $c = 4.692(2)$ $Z = 1$

X-ray Powder Pattern: Tip Top mine, South Dakota, USA.
2.966 (10), 2.525 (9), 2.348 (7), 2.223 (6), 3.364 (5), 2.077 (5), 3.808 (4)

Chemistry:	(1)
	P ₂ O ₅ 55.1
	Al ₂ O ₃ 0.3
	MnO 0.2
	BeO 15.1
	CaO 4.3
	Li ₂ O 4.5
	Na ₂ O 6.1
	K ₂ O 9.9
	H ₂ O 3.4
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	Total 98.9

(1) Tip Top mine, South Dakota, USA; by electron microprobe, Li and Be by AA, H₂O by TGA; based on crystal-structure analysis, approximates $\text{K}_2(\text{Li}_{2.9}\text{Na}_{1.7}\text{Ca}_{0.7})_{\Sigma=5.3}\text{Be}_6(\text{PO}_4)_6(\text{OH})_2 \cdot 1.3\text{H}_2\text{O}$.

Occurrence: On fracture surfaces in earlier minerals in a complex zoned granite pegmatite.

Association: Roscherite, fransoletite, montgomeryite, englishite, beryl, quartz, microcline.

Distribution: From the Tip Top mine, about 8.5 km southwest of Custer, Custer Co., South Dakota, USA.

Name: For its first-noted occurrence at the Tip Top mine, South Dakota, USA.

Type Material: Canadian Museum of Nature, Ottawa, Canada, 48833; Museum of Geology, South Dakota School of Mines, Rapid City, South Dakota, 81-5102; National Museum of Natural History, Washington, D.C., USA, 149609.

References: (1) Grice, J.D., D.R. Peacor, G.W. Robinson, J. Van Velthuisen, W.L. Roberts, T.J. Campbell, and P.J. Dunn (1985) Tiptopite (Li, K, Na, Ca, □)₈Be₆(PO₄)₆(OH)₄, a new mineral species from the Black Hills, South Dakota. *Can. Mineral.*, 23, 43–46. (2) (1986) *Amer. Mineral.*, 71, 230 (abs. ref. 1). (3) Peacor, D.R., R.C. Rouse, and J.-H. Ahn (1987) Crystal structure of tiptopite, a framework beryllophosphate isotypic with basic cancrinite. *Amer. Mineral.*, 72, 816–820.