

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As acicular to tabular crystals to 7 mm, as divergent radial aggregates to 1 mm.

**Physical Properties:** *Cleavage:* n.d. *Fracture:* n.d. *Tenacity:* n.d. *Hardness* = ~2.5  
D(meas.) = 2.84 D(calc.) = 3.00

**Optical Properties:** Translucent. *Color:* Light blue or bright sky-blue. *Streak:* Light blue.  
*Luster:* Vitreous.

*Optical Class:* Biaxial (+).  $\alpha = 1.585(2)$   $\beta = 1.615(3)$   $\gamma = 1.648(2)$   $2V(\text{calc.}) = 80^\circ\text{-}90^\circ$

*Pleochroism:* X = colorless, Y = sky blue, Z = bright blue. *Absorption:* Z > Y > X.

Positive elongation with extinction angle = 5°.

**Cell Data:** *Space Group:* C2/m.  $a = 12.346(3)$   $b = 2.907(3)$   $c = 10.369(7)$   $\beta = 97.90(2)^\circ$   $Z = 1$

**X-ray Powder Pattern:** Khaidarkan Sb-Hg deposit, Kyrgyzstan.

4.232 (100), 2.362 (100), 5.589 (90), 2.828 (90), 10.29 (80), 1.871 (80), 1.817 (80)

Chemistry:	(1)	(2)
Na <sub>2</sub> O	1.58	
CuO	46.09	47.76
Al <sub>2</sub> O <sub>3</sub>	22.35	22.95
SiO <sub>2</sub>	0.78	
SO <sub>3</sub>	2.32	
H <sub>2</sub> O	22.30	24.34
F	8.05	8.55
- O = F	3.39	3.60
Total	100.09	100.00

(1) Khaidarkan Sb-Hg deposit, Kyrgyzstan; average electron microprobe and wet chemical analyses; corresponds to Na<sub>0.35</sub>Cu<sub>4</sub>Al<sub>2.96</sub>(OH)<sub>13.71</sub>F<sub>2.92</sub>(SO<sub>4</sub>)<sub>0.29</sub>(SiO<sub>4</sub>)<sub>0.09</sub>·1.47H<sub>2</sub>O. (2) Cu<sub>4</sub>Al<sub>3</sub>(OH)<sub>14</sub>F<sub>3</sub>·2H<sub>2</sub>O.

**Mineral Group:** Cyanotrichite group.

**Occurrence:** Secondary in highly oxidized, copper-bearing, fluorite-rich veinstone that locally evolved small quantities of hydrofluoric acid (HF) during weathering (Great Sled Dale).

**Association:** Calcite, quartz, baryte, fluorite, malachite, Cu-allophane, conichalcite, chrysocolla, an Al-fluorhydroxide.

**Distribution:** From the Khaidarkan Sb-Hg deposit, Kyrgyzstan [TL]. At Great Sled Dale, Angram Common, Keld, Swaledale, North Yorkshire, England.

**Name:** For the locality from which the first samples were collected.

**Type Material:** A.E. Fersman Mineralogical Museum, Moscow, and the S.V. Tsaregorodtsev collection at the Ilmenskii Reservation, South Urals, Russia.

**References:** (1) Chukanov, N.V., V.Yu. Karpenko, R.K. Rastsvetaeva, A.E. Zadov, and O.V. Kuz'mina (1999) Khaidarkanite Cu<sub>4</sub>Al<sub>3</sub>(OH)<sub>14</sub>F<sub>3</sub>·2H<sub>2</sub>O, a new mineral from the Khaidarkan deposit, Kyrgyzstan. *Zapiski Vseross. Mineral. Obshch.*, 128(3), 58-63 (in Russian). (2) (2000) *Amer. Mineral.*, 85, 1322 (abs. ref. 1). (3) Hager, S.L., P. Leverett, and P.A. Williams (2009) Possible structural and chemical relationships in the cyanotrichite group. *Can. Mineral.*, 47, 635-648. (4) Cotterell, T.F. and I. Dossett (2018) The first British occurrence of khaidarkanite from Great Sled Dale, Angram Common, Keld, Swaledale, North Yorkshire, UK. *Proceedings Yorkshire Geol. Soc.*, 62(2), 142-146.