Khaidarkanite $Cu_4Al_3(OH)_{14}F_3 \cdot 2H_2O$

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 (+). α = 1.585(2) β = 1.615(3) γ = 1.648(2) 2V(calc.) = 80°-90°
Pleochroism: *X* = colorless, *Y* = sky blue, *Z* = bright blue. *Absorption*: *Z* > *Y* > *X*.
Positive elongation with extinction angle = 5°.

Cell Data: *Space Group*: *C*2/*m.* *a* = 12.346(3) *b* = 2.907(3) *c* = 10.369(7) β = 97.90(2)° 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_2O	1.58	
CuO	46.09	47.76
Al_2O_3	22.35	22.95
SiO_2	0.78	
SO_3	2.32	
H_2O	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 $Na_{0.35}Cu_4Al_{2.96}(OH)_{13.71}F_{2.92}(SO_4)_{0.29}(SiO_4)_{0.09} \cdot 1.47H_2O$. (2) $Cu_4Al_3(OH)_{14}F_3 \cdot 2H_2O$.

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 $Cu_4Al_3(OH)_{14}F_3 \cdot 2H_2O$, 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.