

Antipinite **$\text{KNa}_3\text{Cu}_2(\text{C}_2\text{O}_4)_4$**

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As imperfect, equant to prismatic crystals, to 0.15 mm.

Physical Properties: *Cleavage:* Medium in three directions (not determined). *Fracture:* n.d.
Tenacity: Brittle. *Hardness* = ~2 *D(meas.)* = 2.53(3) *D(calc.)* = 2.549 Soluble in water.

Optical Properties: Translucent. *Color:* Blue. *Streak:* Pale blue, almost white. *Luster:* Vitreous.
Optical Class: Biaxial (+). $\alpha = 1.432(2)$ $\beta = 1.530(1)$ $\gamma = 1.698(5)$ $2V(\text{meas.}) = 75(10)^\circ$
 $2V(\text{calc.}) = 82^\circ$ *Dispersion:* Strong, $r < v$. *Pleochroism:* Strong, $Z = \text{blue}$; $Y = \text{light blue}$;
 $X = \text{colorless}$. *Absorption:* $Z > Y > X$.

Cell Data: *Space Group:* $P\bar{1}$. $a = 7.1574(5)$ $b = 10.7099(8)$ $c = 11.1320(8)$
 $\alpha = 113.093(1)^\circ$ $\beta = 101.294(1)^\circ$ $\gamma = 90.335(1)^\circ$ $Z = 2$

X-ray Powder Pattern: Pabellón de Pica Mountain, Iquique Province, Tarapacá Region, Chile.
 3.47 (100), 3.39 (80), 5.22 (40), 2.543 (40), 3.01 (30), 2.481 (30), 2.315 (30)

Chemistry:	(1)	(2)	(3)
Na ₂ O	15.95	K	11.83
K ₂ O	5.65	Na	6.35
CuO	27.34	Cu	21.84
C ₂ O ₃	48.64	C	16.22
		O	n.d.
Total	99.58		56.24
			99.99

(1) Pabellón de Pica Mountain, Iquique Province, Tarapacá Region, Chile; average of 5 electron microprobe analyses, supplemented by IR spectroscopy, C by gas chromatography; corresponding to $\text{K}_{0.96}\text{Na}_{3.04}\text{Cu}_{2.03}(\text{C}_{2.00}\text{O}_4)_4$. (2) Pabellón de Pica Mountain, Iquique Province, Tarapacá Region, Chile; average of 5 electron microprobe analyses supplemented by IR spectroscopy, C by gas chromatography. (3) $\text{KNa}_3\text{Cu}_2(\text{C}_2\text{O}_4)_4$.

Occurrence: In a guano deposit, as a secondary mineral with guano as the source of oxalate groups and oxidized chalcopyrite, from underlying gabbro, as the source of Cu.

Association: Halite, salammoniac, chanabayaite, joanneumite.

Distribution: From the lower part of the northern slope of Pabellón de Pica Mountain, 1.5 km south of Chanabaya village, Iquique Province, Tarapacá Region, Chile.

Name: Honors Mikhail Yuvenal'evich Antipin (1951-2013), a Russian specialist in the crystallography and crystal chemistry of organometallic and coordination compounds.

Type Material: Freiberg Mining Academy and University of Technology, Freiberg, Germany (83870).

References: (1) Chukanov, N.V., S.M. Aksenov, R.K. Rastsvetaeva, K.A. Lyssenko, D.I. Belakovskiy, G. Färber, G. Möhn and K.V. Van (2015) Antipinite, $\text{KNa}_3\text{Cu}_2(\text{C}_2\text{O}_4)_4$, a new mineral species from a guano deposit at Pabellón de Pica, Chile. *Mineral. Mag.*, 79(5), 1111-1121. (2) (2016) *Amer. Mineral.*, 101, 2123 (abs. ref. 1).