

Mitryaevaite

 $\text{Al}_{11}(\text{PO}_4, \text{SO}_3\text{OH})_{10}\text{F}_3 \cdot 30\text{H}_2\text{O}$

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Crystal Data: Triclinic. *Point Group:* $\bar{1}$ or 1. As prismatic crystals, to 0.04 mm, rarely in globular nodules; massive, in veinlets and powdery coatings.

Physical Properties: *Cleavage:* On {001}, perfect; on {010}, {100}, good. Hardness = n.d. D(meas.) = 2.02 D(calc.) = 2.033

Optical Properties: Transparent in microcrystals. *Color:* White to colorless. *Streak:* White. *Luster:* Vitreous, dull in massive nodules.

Optical Class: Biaxial. *Orientation:* $Z \wedge b = 14^\circ$; positive elongation. $\alpha = 1.504(1)$ $\beta = \text{n.d.}$ $\gamma = 1.515(1)$ $2V(\text{meas.}) = \text{n.d.}$

Cell Data: *Space Group:* $P\bar{1}$ or $P1$. $a = 6.92(1)$ $b = 10.09(1)$ $c = 22.46(1)$
 $\alpha = 92.42(4)^\circ$ $\beta = 96.43(7)^\circ$ $\gamma = 104.3(2)^\circ$ $Z = 1$

X-ray Powder Pattern: Kazakhstan.

9.75 (10), 6.35 (3), 9.24 (2), 3.333 (2), 3.222 (2), 2.923 (2), 7.54 (1)

Chemistry:

	(1)	(2)
SO ₃	5.50	5.49
P ₂ O ₅	32.40	32.50
SO ₂	trace	
Al ₂ O ₃	30.00	29.47
Fe ₂ O ₃	0.30	2.40
MgO	trace	
CaO	0.90	0.74
F	3.00	
H ₂ O ⁺	27.80	
H ₂ O ⁻	1.90	
H ₂ O		[29.40]
-O = F ₂	1.27	
Total	100.53	[100.00]

(1) Kazakhstan; H₂O by TGA, corresponds to Al_{10.08}[(PO₄)_{8.71}(SO₃OH)_{1.29}]_{Σ=10.00} Al_{1.00}[F_{2.97}(OH)_{0.03}]_{Σ=3.00} • 29.63H₂O. (2) Do.; by electron microprobe, average of four analyses, total Fe as Fe₂O₃, thought high due to a film of secondary goethite on the surface, H₂O by difference.

Occurrence: A secondary mineral in fractures and veinlets, in altered and oxidized vanadium-bearing phosphatic black shales.

Association: Minyulite, crandallite, gorceixite, wavellite, variscite, evansite, aluminite, meta-aluminite, kaolinite, hewettite, gypsum.

Distribution: In the Kurumsak Formation, from the Taldyk mining district, northwestern Kara-Tau Range to the Zhabagly Mountains, Tien-Shan, southern Kazakhstan.

Name: To honor Dr. Nonna Mikhailovna Mitryaeva (1920–), for her contributions to the mineralogy of Kazakhstan.

Type Material: Geological Museum, Satpaev Institute of Geological Sciences, Alma-Ata, Kazakhstan, GM IGS 24/1270.

References: (1) Ankinovich, E.A., G.K. Bekenova, T.A. Shabanova, I.S. Zazubina, and S.M. Sandomirskaya (1997) Mitryaevaite, Al₁₀[(PO₄)_{8.7}(SO₃OH)_{1.3}]_{Σ10}AlF₃ • 30H₂O, a new mineral species from a Cambrian carbonaceous chert formation, Karatau Range and Zhabagly Mountains, southern Kazakhstan. *Can. Mineral.*, 35, 1415–1419. (2) (1999) *Amer. Mineral.*, 84, 194–195 (abs. ref. 1).

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