Mitryaevaite

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

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

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

\text{Optical Properties:} \ \text{Transparent} \ \text{in} \ \text{microcrystals.} \ \text{Color:} \ \text{White} \ \text{to} \ \text{colorless.} \ \text{Streak:} \ \text{White.} \ \text{Luster:} \ \text{Vitreous,} \ \text{dull} \ \text{in} \ \text{massive} \ \text{nodules.}

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

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

\text{X-ray Powder Pattern:} \ \text{Kazakhstan.} \ \text{9.75 (10), 6.35 (3), 9.24 (2), 3.333 (2), 3.222 (2), 2.923 (2), 7.54 (1)}

\text{Chemistry:}

\begin{align*}
\text{SO}_3 & \quad 5.50 \quad 5.49 \\
\text{P}_2\text{O}_5 & \quad 32.40 \quad 32.50 \\
\text{SO}_2 & \quad \text{trace} \\
\text{Al}_2\text{O}_3 & \quad 30.00 \quad 29.47 \\
\text{Fe}_2\text{O}_3 & \quad 0.30 \quad 2.40 \\
\text{MgO} & \quad \text{trace} \\
\text{CaO} & \quad 0.90 \quad 0.74 \\
\text{F} & \quad 3.00 \\
\text{H}_2\text{O}^+ & \quad 27.80 \\
\text{H}_2\text{O}^- & \quad 1.90 \\
\text{H}_2\text{O} & \quad [29.40] \\
\text{=O = F}_2 & \quad 1.27 \\
\text{Total} & \quad 100.53 \quad [100.00]
\end{align*}

(1) Kazakhstan; \text{H}_2\text{O by TGA, corresponds to Al}_{10.08}[(\text{PO}_4)_{8.71}(\text{SO}_3\text{OH})_{1.29}]\Sigma=10.00

\text{Al}_{1.00}[(\text{Fe}_{2.97}(\text{OH})_{0.03})\Sigma=3.00] \cdot 29.63\text{H}_2\text{O}. \ (2) \ \text{Do.; by electron microprobe, average of four analyses, total Fe as} \ \text{Fe}_2\text{O}_3, \ \text{thought high due to a film of secondary goethite on the surface, H}_2\text{O by difference.}

\text{Occurrence:} \ \text{A secondary mineral in fractures and veinlets, in altered and oxidized vânadum-bearing phosphatic black shales.}

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

\text{Distribution:} \ \text{In the Kurumsak Formation, from the Taldyk mining district, northwestern Kàra-Tau Range to the Zhabagly Mountains, Tien-Shan, southern Kazakhstan.}

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

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

\text{References:} \ (1) \ \text{Ankinovich, E.A., G.K. Bekenova, T.A. Shabanova, I.S. Zazubina, and S.M. Sandomirskaya (1997) Mitryaevaite, Al}_{10.08}[(\text{PO}_4)_{8.71}(\text{SO}_3\text{OH})_{1.29}]\Sigma=10.00 \ \text{Al}_{1.00}[(\text{Fe}_{2.97}(\text{OH})_{0.03})\Sigma=3.00] \cdot 29.63\text{H}_2\text{O}. \ (2) \ \text{Do.; by electron microprobe, average of four analyses, total Fe as} \ \text{Fe}_2\text{O}_3, \ \text{thought high due to a film of secondary goethite on the surface, H}_2\text{O by difference.}

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