

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As thick blades elongated along $[10\bar{1}]$ and flattened on dominant $\{111\}$, to 0.2 mm; commonly in subparallel intergrowths and divergent groups.

Physical Properties: *Cleavage:* Two very good, one on $\{111\}$ and one along the length of the blades and at an angle to the $\{111\}$ face, possibly on $\{010\}$. *Tenacity:* Brittle. *Fracture:* Curved. Hardness = 2 D(meas.) = 2.45(2) D(calc.) = 2.448 Easily soluble in dilute HCl.

Optical Properties: Translucent. *Color:* Saffron-yellow. *Streak:* Pale orange-yellow. *Luster:* Vitreous.

Optical Class: Biaxial. $\alpha = 1.755(5)$ $\beta < 1.80$ $\gamma > 1.80$ $2V = \text{n.d.}$ *Orientation:* n.d.

Pleochroism: X and Y = yellow, Z = orange. *Absorption:* $X \approx Y < Z$.

Cell Data: *Space Group:* $P\bar{1}$. $a = 9.435(2)$ $b = 10.742(3)$ $c = 11.205(3)$ $\alpha = 75.395(7)^\circ$ $\beta = 71.057(10)^\circ$ $\gamma = 81.286(6)^\circ$ $Z = 1$

X-Ray Diffraction Pattern: Burro mine, Slick Rock district, San Miguel Co., Colorado, USA. 10.38 (100), 7.24 (38), 8.89 (37), 5.922 (17), 8.15 (13), 2.083 (13), 2.177 (11)

Chemistry:	(1)	(2)
MgO	0.28	
CaO	0.08	
Al ₂ O ₃	12.98	13.35
V ₂ O ₅	59.51	59.53
H ₂ O	[27.15]	27.12
Total	100.00	100.00

(1) Burro mine, Slick Rock district, San Miguel Co., Colorado, USA; normalized average electron microprobe analysis, H₂O calculated from structure; corresponding to $[(\text{Al}_{3.89}\text{Mg}_{0.11}\text{Ca}_{0.02})_{\Sigma=4.02}(\text{OH})_6(\text{H}_2\text{O})_{12}][\text{H}_{0.06}\text{V}_{10}\text{O}_{28}] \cdot 8\text{H}_2\text{O}$. (2) $[\text{Al}_4(\text{OH})_6(\text{H}_2\text{O})_{12}][\text{V}_{10}\text{O}_{28}] \cdot 8\text{H}_2\text{O}$.

Mineral Group: Decavanadate family.

Occurrence: In a low-temperature, post-mining, underground, secondary mineral assemblage formed on montroseite- and corvusite-bearing sandstone by oxidation in a moist environment.

Association: Ammoniozippeite, gypsum, postite.

Distribution: From the Burro mine, Slick Rock district, San Miguel Co., Colorado, USA.

Name: The prefix compares this new mineral's structure to *caseyite*, which contains sheets of Al^{3+} linked by μ_3 -OH bridges (referred to as "flatimers"). The $[\text{Al}_4(\text{OH})_6(\text{H}_2\text{O})_{12}]^{6+}$ tetramer in this new phase, even though it has no μ_3 -OH bridges, is the smallest cluster that is stable by coordination by hydrogen bonding to a decametallate anion.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (75191, 75192, and 75193).

References: (1) Kampf, A.R., M.A. Cooper, J.M. Hughes, C. Ma, W.H. Casey, F.C. Hawthorne, and J. Marty (2022) Protocaseyite, a new decavanadate mineral containing a $[\text{Al}_4(\text{OH})_6(\text{H}_2\text{O})_{12}]^{6+}$ linear tetramer, a novel isopolycation. *Amer. Mineral.*, 107, 1181-1189.