

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As blades flattened on {110} and striated and elongated along [001] to 1 mm; and as subparallel or divergent aggregates or botryoidal.

Physical Properties: *Cleavage:* Fair on {001}, {110} and $\{\bar{1}\bar{1}0\}$. *Tenacity:* Brittle.
Fracture: Curved. Hardness = ~2 D(meas.) = 2.36(2) D(calc.) = 2.351
 Dissolves in dilute HCl.

Optical Properties: Transparent. *Color:* Very dark greenish blue; pearly green (aggregates); dark blue in transmitted light. *Streak:* Grayish blue. *Luster:* Vitreous.
Optical Class: Biaxial (-). $\alpha(\text{calc.}) = 1.625$ $\beta = 1.628(2)$ $\gamma = 1.629(2)$ $2V(\text{meas.}) = 60.7(4)^\circ$
 $2V(\text{calc.}) = \text{n.d.}$ *Orientation:* $X \approx \perp \{110\}$, $Z \wedge c \approx 20^\circ$. *Pleochroism:* None.
Dispersion: Moderate, $r < v$.

Cell Data: Space Group: $P\bar{1}$. $a = 18.0572(4)$ $b = 19.4126(4)$ $c = 24.0586(17)$
 $\alpha = 87.364(6)^\circ$ $\beta = 86.266(6)^\circ$ $\gamma = 79.267(6)^\circ$ $Z = 2$

X-ray Powder Pattern: Packrat mine, Gateway district, Mesa County, Colorado, USA.
 10.5 (100), 14.5 (49), 12.1 (49), 2.939 (22), 2.732 (22), 7.45 (20), 2.846 (19)

Chemistry:	(1)	(2)
Na ₂ O	0.30	0.27
CaO	11.29	10.27
As ₂ O ₃		[3.38]
As ₂ O ₅	31.28	[24.49]
VO ₂		[5.57]
V ₂ O ₅	40.23	[30.46]
<u>H₂O</u>		<u>[25.56]</u>
Total	83.22	100.00

- (1) Packrat mine, Gateway district, Colorado, USA; average of 4 electron microprobe analyses.
 (2) Analysis 1 normalized, H₂O calculated from structure, As and V apportioned for charge balance and structural criteria; corresponds to $(\text{Ca}_{10.72}\text{Na}_{0.51})_{\Sigma=11.23}(\text{As}^{3+}\text{V}^{4+}_{1.97}\text{V}^{5+}_{9.80}\text{As}^{5+}_{6.23}\text{O}_{51})_2 \cdot 83\text{H}_2\text{O}$.

Occurrence: A secondary mineral formed by the oxidation of montroseite-corvusite assemblages in a moist environment.

Association: Gatewayite, morrisonite, vanarsite, pharmacolite, montroseite, corvusite.

Distribution: From the Packrat mine, Gateway district, Mesa County, Colorado, USA.

Name: For the Packrat mine.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (64513 and 64514).

References: (1) Kampf, A.R., J.M. Hughes, B.P. Nash, and J. Marty (2016) Vanarsite, packratite, morrisonite, and gatewayite: four new minerals containing the $[\text{As}^{3+}\text{V}^{4+,5+}_{12}\text{As}^{5+}_6\text{O}_{51}]$ heteropolyanion, a novel polyoxometalate cluster. *Can. Mineral.*, 54, 145-162. (2) (2017) *Amer. Mineral.*, 102, 1145-1146 (abs. ref. 1).