Ferrilotharmeyerite $\mathbf{Ca(Fe^{3+}, Zn, Cu)_2(AsO_4)_2(OH, H_2O)_2}$

Crystal Data: Monoclinic. *Point Group:* $2/m$. As subhedral crystals, to 0.6 mm, tabular on $\{\overline{1}01\}$, slightly elongated along [010], wedge- or lozenge-shaped, terminated by $\{\overline{1}11\}$, composed of multiple crystallites.

Physical Properties: *Cleavage:* Good on {001}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = ∼3 D(meas.) = 4.25(5) D(calc.) = 4.21–4.38

Optical Properties: Transparent to translucent. *Color:* Yellow, brownish yellow, yellowish brown. *Streak:* Very pale yellow. *Luster:* Adamantine to greasy.
Optical Class: Biaxial (+). *Pleochroism:* Strong; X = olive-green or orange; Y = pale green or yellow; Z = colorless. *Orientation:* $X = b$; $Y \wedge c = \sim 22°$. *Dispersion:* $r > v$, distinct, inclined. *Absorption:* $X > Y \gg Z$. $\alpha = 1.83(1)$ $\beta = [1.835]$ $\gamma = 1.87(1)$ 2V(meas.) = 40°

Cell Data: *Space Group:* $C2/m$. $a = 8.997$–9.010 $b = 6.236$–6.246 $c = 7.387$–7.391 $\beta = 115.52-115.74°$ Z = 2

X-ray Powder Pattern: Tsumeb, Namibia.
3.398 (100), 3.175 (100), 2.938 (100), 2.544 (100), 4.95 (70), 2.823 (70), 2.702 (70)

Chemistry:

	(1)	(2)
As_2O_5	48.66	48.73
Al_2O_3	0.13	< 0.1
Fe_2O_3	13.96	15.68
CuO	5.75	< 0.1
ZnO	13.94	17.88
PbO	2.13	0.14
CaO	10.86	12.07
H_2O	5.85	[5.80]
Total	101.28	[100.30]

(1) Tsumeb, Namibia; by electron microprobe, H_2O by CHN analyzer; corresponds to $(Ca_{0.92}Pb_{0.05})_{\Sigma=0.97}(Fe_{0.87}Zn_{0.81}Cu_{0.34}Al_{0.01})_{\Sigma=2.03}(AsO_4)_2(OH, H_2O)_2$. (2) Do.; by electron microprobe, average of 20 analyses, total Fe as Fe_2O_3, H_2O calculated from theory; corresponds to $Ca_{1.02}(Fe_{0.93}Zn_{1.04})_{\Sigma=1.97}(AsO_4)_{2.02}[(H_2O)_{1.08}(OH)_{0.90}]_{\Sigma=1.98}$.

Mineral Group: Tsumcorite group.

Occurrence: Very rare, on museum specimens from a dolostone-hosted hydrothermal polymetallic ore deposit.

Association: Conichalcite, scorodite, schneiderhöhnite, beudantite, tennantite, calcite.

Distribution: From Tsumeb, Namibia.

Name: As the *ferric* iron analog of *lotharmeyerite*.

Type Material: Canadian Geological Survey, Ottawa, Canada, NMC 64573; Museum Victoria, Melbourne, Australia, M38092.

References: (1) Ansell, H.G., A.C. Roberts, P.J. Dunn, W.D. Birch, and V.E. Ansell (1992) Ferrilotharmeyerite, a new Ca–Zn–Fe^{3+} hydroxyl arsenate from Tsumeb, Namibia. Can. Mineral., 30, 225–227. (2) (1992) Amer. Mineral., 77, 1305–1306 (abs. ref. 1). (3) Krause, W., K. Belendorff, H.-J. Bernhardt, C. McCammon, H. Effenberger, and W. Mikenda (1998) Crystal chemistry of the tsumcorite-group minerals. New data on ferrilotharmeyerite, tsumcorite, thometzekite, mounanaite, helmutwinklerite, and a redefinition of gartrellite. Eur. J. Mineral., 10, 179–206.