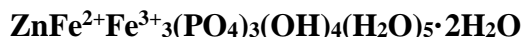


Wilhelmgümbelite

Crystal Data: Orthorhombic. *Point Group:* 2/m 2/m 2/m. As radiating sprays of needlelike rectangular laths elongated along [100] and flattened on {010}, to 0.2 mm

Physical Properties: *Cleavage:* Perfect on {010}. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = n.d. D(meas.) = 2.89 D(calc.) = 2.82

Optical Properties: Translucent. *Color:* Light yellow-brown to orange-red.

Streak: Pale yellow-brown. *Luster:* Dull.

Optical Class: Biaxial (+). $\alpha = 1.560(2)$ $\beta = 1.669(2)$ $\gamma = 1.718(2)$ $2V(\text{meas.}) = 63(1)^\circ$
 $2V(\text{calc.}) = 65^\circ$ *Orientation:* $X = b$, $Y = c$, $Z = a$. *Absorption:* $Z \gg Y > X$. *Dispersion:* Weak, $v > r$.
Pleochroism: Weak, $Z = \text{orange-brown}$, $Y = \text{yellow-brown}$, $X = \text{light yellow-brown}$.

Cell Data: *Space Group:* *Pmab*. $a = 10.987(7)$ $b = 25.378(13)$ $c = 6.387(6)$ $Z = 4$

X-ray Powder Pattern: Cornelia mine, Hagendorf-Süd pegmatite, Oberpfalz, Bavaria, Germany. 12.65 (100), 4.223 (30), 6.421 (14), 6.228 (8), 2.111 (7), 8.339 (5), 5.098(5)

| | |
|--------------------------------|---------------|
| Chemistry: | (1) |
| ZnO | 16.4 |
| MnO | 2.6 |
| FeO | [5.8] |
| Fe ₂ O ₃ | [25.0] |
| P ₂ O ₅ | 28.7 |
| <u>H₂O</u> | <u>[23.4]</u> |
| Total | 101.9 |

(1) Cornelia mine, Hagendorf-Süd pegmatite, Oberpfalz, Bavaria, Germany; average of 7 electron microprobe analyses supplemented by IR spectroscopy, H₂O and Fe₂O₃/FeO calculated from structure; corresponds to Zn_{1.50}Mn²⁺_{0.27}Fe²⁺_{0.60}Fe³⁺_{2.33}(PO₄)₃(OH)_{2.73}(H₂O)_{8.27}.

Occurrence: In the highly oxidized portion of a phosphate-bearing granitic pegmatite, probably formed from schoonerite by replacement reactions (enrichment of Zn and Fe, depletion of Mn) together with oxidation of Fe²⁺ to Fe³⁺.

Association: Phosphophyllite partially altered to steinmetzite, albite, Sr-bearing apatite, chalcophanite, jahnsite, mitridatite, muscovite, quartz.

Distribution: Found on the 67 m level, Cornelia open-cut mine, Hagendorf-Süd pegmatite, Hagendorf, Oberpfalz, Bavaria, Germany.

Name: Honors Dr. Carl Wilhelm von Gümbel (1823-1898), who was appointed by King Maximilian II to lead the geological studies of Bavaria and provided essential contributions to the mineralogical and geological investigation of pegmatites and their minerals in the northeastern parts of Bavaria.

Type Material: Museum Victoria, Melbourne, Victoria, Australia (M53512).

References: (1) Grey, I.E., E. Keck, A.R. Kampf, C.M. Macrae, A.M. Glenn, and J.R. Price (2017) Wilhelmgümbelite, [ZnFe²⁺Fe³⁺₃(PO₄)₃(OH)₄(H₂O)₅·2H₂O, a new schoonerite-related mineral from the Hagendorf Süd pegmatite, Bavaria. *Mineral. Mag.*, 81(2), 287-296. (2) (2017) *Amer. Mineral.*, 102, 2346-2347 (abs. ref. 1).