

Kummerite

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. Typically as deformed laths in sprays or rounded aggregates, to 500 μm .

Physical Properties: *Cleavage:* Good on {010}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = n.d. D(meas.) = n.d. D(calc.) = 2.34

Optical Properties: Translucent. *Color:* Amber-yellow. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (-). $\alpha = 1.565(5)$ $\beta = 1.600(5)$ $\gamma = 1.630(5)$ *Dispersion:* Weak. $2V(\text{meas.}) = \text{n.d.}$ $2V(\text{calc.}) = 84(?)^\circ$ *Pleochroism:* Weak, tones of amber yellow. Displays fine-scale undulose extinction.

Cell Data: *Space Group:* $P\bar{1}$. $a = 5.316(1)$ $b = 10.620(3)$ $c = 7.118(1)$ $\alpha = 107.33(3)^\circ$ $\beta = 111.22(3)^\circ$ $\gamma = 72.22(2)^\circ$ $Z = 1$

X-ray Powder Pattern: Cornelia Mine Open Cut, Hagendorf, Oberpfalz, Bavaria, Germany. 9.885 (100), 4.942 (30), 6.476 (20), 3.116 (18), 2.873 (11), 3.988 (9), 3.235 (9)

Chemistry:	(1)	(2)
Fe ₂ O ₃	[19.1]	17.2
FeO	[5.3]	5.3
MnO	5.9	5.4
MgO	2.2	2.4
ZnO	0.5	0.5
Al ₂ O ₃	10.7	10.7
P ₂ O ₅	30.2	30.2
H ₂ O	[32.5]	32.5
Total	106.6	100.0

(1) Cornelia Mine Open Cut, Hagendorf, Oberpfalz, Bavaria, Germany; average of 13 electron microprobe analyses supplemented by IR spectroscopy, H₂O and Fe₂O₃:FeO calculated.

(2) Analysis 1 normalized; corresponds to $(\text{Mn}^{2+}_{0.37}\text{Mg}_{0.27}\text{Zn}_{0.03}\text{Fe}^{2+}_{0.33})_{\Sigma=1.00}(\text{Fe}^{3+}_{1.06}\text{Al}_{0.94})_{\Sigma=2.00}(\text{PO}_4)_{1.91}(\text{OH})_{2.27}(\text{H}_2\text{O})_{7.73}$.

Mineral Group: Laueite group.

Occurrence: A secondary mineral in pegmatite formed by the reaction of laueite with Al-bearing hydrothermal fluids.

Association: Zwieselite, Zn- and Al-bearing beraunite, Al-bearing frondelite, jahnsite-(CaMnMn).

Distribution: From the 57 ± 2 m level, Cornelia Mine Open Cut, Hagendorf-Süd pegmatite, Hagendorf, Oberpfalz, Bavaria, Germany.

Name: Honors Rudolf Kummer (1924-1982), mining director of the Cornelia mine at Hagendorf Süd from 1964-1982 for his appreciation of and familiarity with the mineral occurrences at the mine and support for researchers and collectors who studied and collected samples from the mine.

Type Material: Museum Victoria, Melbourne, Victoria, Australia (M53448).

References: (1) Grey, I.E., E. Keck, W.G. Mumme, A. Pring, C.M. MacRae, A.M. Glenn, C.J. Davidson, F.L. Shanks, and S.J. Mills (2016) Kummerite, $\text{Mn}^{2+}\text{Fe}^{3+}\text{Al}(\text{PO}_4)_2(\text{OH})_2 \cdot 8\text{H}_2\text{O}$, a new laueite-group mineral from the Hagendorf Süd pegmatite, Bavaria, with ordering of Al and Fe³⁺. Mineral. Mag., 80(7), 1243-1254. (2) (2017) Amer. Mineral., 102, 695-696 (abs. ref. 1).