

Hentschelite

$\text{CuFe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2$

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Crystal Data: Monoclinic. *Point Group:* $2/m$. As wedge-shaped crystals, elongated along [102], to 1 mm, composed of $\{\bar{1}11\}$, $\{11\bar{1}\}$, $\{011\}$, $\{01\bar{1}\}$, in parallel composites, and as pseudo-octahedra; in spherulites with radial structure. *Twinning:* Common, contact twins by rotation around [102], yielding a triangular composite.

Physical Properties: *Fracture:* Irregular. Hardness = 3.5 D(meas.) = n.d. D(calc.) = 3.79

Optical Properties: Translucent. *Color:* Dark green to greenish black. *Streak:* Pale green. *Luster:* Vitreous.

Optical Class: Biaxial (+). *Pleochroism:* Weak; X = blue-green; Y = yellow-green or yellowish brown. *Orientation:* Y = b; X \wedge a = 61(2)°; X \simeq [101]. *Dispersion:* $r \gg v$, strong. $\alpha = 1.843(3)$ $\beta = 1.848(3)$ $\gamma = 1.945(3)$ 2V(meas.) = Small.

Cell Data: *Space Group:* $P2_1/n$. a = 6.984(3) b = 7.786(3) c = 7.266(3)
 $\beta = 117.68(2)^\circ$ Z = 2

X-ray Powder Pattern: Reichenbach, Germany.

3.331 (100), 3.287 (58), 4.798 (38), 1.665 (24), 1.644 (18), 4.960 (17), 6.091 (15)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
P ₂ O ₅	33.24	35.24	35.56	Fe ₂ O ₃	36.37	42.31	40.00
As ₂ O ₅	2.11	0.67		CuO	19.89	15.24	19.93
SiO ₂	0.03			H ₂ O	4.40		4.51
Al ₂ O ₃	1.52	0.23		Total	97.56	93.69	100.00

(1) Reichenbach, Germany; by electron microprobe, average of ten analyses, total Fe as Fe₂O₃, H₂O calculated for neutrality as OH⁻; corresponding to Cu_{1.03}(Fe_{1.87}³⁺Al_{0.12})_{Σ=1.99} [(PO₄)_{1.92}(AsO₄)_{0.08}]_{Σ=2.00}(OH)₂. (2) Spring Creek mine, Australia; by electron microprobe, total Fe as Fe₂O₃, H₂O by DTA, Fe²⁺ estimated by analogy to the ideal structural formula of the lazulite group, then corresponding to (Cu_{0.84}Fe_{0.15}²⁺)_{Σ=0.99}(Fe_{1.93}³⁺Al_{0.02})_{Σ=1.95} [(PO₄)_{2.05}(AsO₄)_{0.03}]_{Σ=2.08}(OH)_{1.79}. (3) CuFe₂(PO₄)₂(OH)₂.

Mineral Group: Lazulite group.

Occurrence: A rare secondary mineral in some oxidized copper deposits.

Association: Mimetite, beudantite, phosphogartrellite, goethite, quartz (Reichenbach, Germany); rockbridgeite, chalcociderite, goethite, cuprite (West Phoenix mine, England); cuprite, copper, malachite, barite (Spring Creek mine, Australia); phosphosiderite, lipscombite, metatorbernite (El Criollo mine, Argentina).

Distribution: From Reichenbach, near Bensheim, Hesse, Germany. In the West Phoenix mine, near Liskeard, and the Phoenix United mines, Linkinhorne, Cornwall, England. At the Bendada pegmatite, near Guarda, Portugal. From the Spring Creek copper mine, near Wilmington, South Australia. In the El Criollo pegmatite, Cerro Blanco, Tanti district, 45 km west of Córdoba, Córdoba Province, Argentina.

Name: Honors Dr. Gerhard Hentschel (1930–), Geological Survey of Hesse, Wiesbaden, Germany.

Type Material: Natural History Museum, Mainz; Mineralogical Museum, University of Würzburg, Würzburg, Germany.

References: (1) Sieber, N.H.W., E. Tillmanns, and O. Medenbach (1987) Hentschelite, CuFe₂(PO₄)₂(OH)₂, a new member of the lazulite group, and reichenbachite, Cu₅(PO₄)₂(OH)₄, a polymorph of pseudomalachite, two new copper phosphate minerals from Reichenbach, Germany. *Amer. Mineral.*, 72, 404–408. (2) Sieber, N.H.W., E. Tillmanns, and W. Hofmeister (1987) Structure of hentschelite, CuFe₂(PO₄)₂(OH)₂, a new member of the lazulite group. *Acta Cryst.*, C43, 1855–1857. (3) Birch, W.D. and W.G. Mumme (1988) Hentschelite and perloffite from the Spring Creek copper mine, South Australia. *Mineral. Mag.*, 52, 408–411.

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