

Phosphogartrellite

$\text{PbCuFe}^{3+}(\text{PO}_4)_2(\text{OH}, \text{H}_2\text{O})_2$

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Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As steeply terminated crystals, to 50 μm , in parallel growths and aggregates.

Physical Properties: Hardness = 4.5 D(meas.) = n.d. D(calc.) = 5.05

Optical Properties: Transparent in thin fragments. *Color:* Bright green. *Streak:* Yellow. *Luster:* Vitreous to adamantine.

Optical Class: Biaxial (+). $\alpha = 1.90(2)$ $\beta = [1.93]$ $\gamma = 2.00(2)$ $2V(\text{meas.}) = 70(5)^\circ$

Cell Data: *Space Group:* $[P\bar{1}]$ (by analogy to gartrellite). $a = 5.320(2)$ $b = 5.528(2)$ $c = 7.434(3)$ $\alpha = 67.61(3)^\circ$ $\beta = 69.68(5)^\circ$ $\gamma = 70.65(4)^\circ$ $Z = 1$

X-ray Powder Pattern: Hohenstein, Germany.

4.360 (100), 2.885 (89), 3.250 (70), 2.868 (69), 4.720 (67), 4.502 (61), 2.459 (53)

Chemistry:

	(1)	(2)
P_2O_5	22.05	25.74
As_2O_5	4.58	
Fe_2O_3	14.14	14.48
CuO	14.41	14.42
PbO	39.02	40.46
CaO	0.20	
H_2O	[4.83]	4.90
Total	99.23	100.00

(1) Hohenstein, Germany; by electron microprobe, total Fe as Fe_2O_3 , confirmed by microchemical tests, H_2O calculated from stoichiometry, presence of both $(\text{OH})^{1-}$ and H_2O confirmed by IR; corresponds to $(\text{Pb}_{0.99}\text{Ca}_{0.02})_{\Sigma=1.01}\text{Cu}_{1.02}\text{Fe}_{1.00}[(\text{PO}_4)_{1.75}(\text{AsO}_4)_{0.23}]_{\Sigma=1.98}[(\text{OH})_{1.12}(\text{H}_2\text{O})_{0.96}]_{\Sigma=2.08}$. (2) $\text{PbCuFe}(\text{PO}_4)_2(\text{OH}) \cdot \text{H}_2\text{O}$.

Mineral Group: Tsumcorite group.

Occurrence: A rare secondary mineral, probably formed by oxidation of earlier sulfides in silicified barite veins.

Association: Hentschelite, pyromorphite, malachite, cuprite.

Distribution: In Germany, on the Hohenstein, near Reichenbach, and at Gadernheim, near Bensheim, Hesse.

Name: As the *phosphate* analog of *gartrellite*.

Type Material: Mineralogical Institute, Ruhr University, Bochum, Germany.

References: (1) Krause, W., K. Belendorff, H.-J. Bernhardt, and K. Petitjean (1998) Phosphogartrellite, $\text{PbCuFe}(\text{PO}_4)_2(\text{OH}) \cdot \text{H}_2\text{O}$, a new member of the tsumcorite group. Neues Jahrb. Mineral., Monatsh., 111–118. (2) (1998) Amer. Mineral., 83, 1117 (abs. ref. 1).