

Brackebuschite**Pb₂(Mn³⁺, Fe³⁺)(VO₄)₂(OH)**

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Crystal Data: Monoclinic. *Point Group:* 2/m. Typically as acicular crystals, elongated and striated || [010], may be lathlike or wedge-shaped, flattened on {001}, with {100}, {001}, {011}, {10 $\bar{2}$ }, {10 $\bar{3}$ }, others, perhaps without terminal faces, to 1.5 mm; in sprays, dendritic, botryoidal.

Physical Properties: Hardness = n.d. D(meas.) = 6.05 D(calc.) = 6.11

Optical Properties: Translucent to nearly opaque. *Color:* Dark brown to black; reddish brown in transmitted light. *Streak:* Yellow. *Luster:* Submetallic.

Optical Class: Biaxial (+). *Pleochroism:* X = nearly colorless; Y = dark reddish brown; Z = reddish brown. *Orientation:* Y = b; X \wedge a = 20°. *Dispersion:* r > v, strong. $\alpha = 2.28$
 $\beta = 2.36\text{--}2.38$ $\gamma = 2.48\text{--}2.49$ 2V(meas.) = $\sim 90^\circ$

Cell Data: *Space Group:* P2₁/m. a = 8.810–8.880 b = 6.135–6.155 c = 7.650–7.681
 $\beta = 111^\circ 30' \text{--} 111^\circ 50'$ Z = 2

X-ray Powder Pattern: Venus mine, Argentina.

3.25 (10), 4.95 (8), 2.76 (8), 2.98 (6), 1.720 (6), 3.08 (5), 2.13 (4)

Chemistry:

	(1)		(1)
P ₂ O ₅	0.18	CuO	0.42
V ₂ O ₅	25.32	ZnO	1.29
FeO	4.65	PbO	61.00
MnO	4.77	H ₂ O	2.03
		Total	99.66

(1) "Sierra de Córdoba," Argentina; corresponds to Pb_{1.88}(Mn_{0.46}³⁺Fe_{0.45}³⁺Zn_{0.11}Cu_{0.04})_{Σ=1.06} [(V_{0.96}P_{0.01})_{Σ=0.97}O_{3.72}]₂(OH)_{1.55}. (2) Do.; by electron microprobe, average of 10 analyses, not given but stated to correspond to (Pb_{1.96}Sr_{0.01}Ca_{0.01})_{Σ=1.98}(Fe_{0.77}³⁺Mn_{0.13}³⁺Cu_{0.03}Zn_{0.02})_{Σ=0.95}(V_{1.02}O₄)₂(OH). (3) Do.; by electron microprobe, average of 29 analyses, not given but stated to correspond to (Pb_{1.89}Sr_{0.02}Ca_{0.03}Ba_{0.01})_{Σ=1.95}(Mn_{0.96}³⁺Fe_{0.04}³⁺Cu_{0.03}Zn_{0.01})_{Σ=1.04} [(V_{1.00}As_{0.01})_{Σ=1.01}O₄]₂(OH).

Mineral Group: Brackebuschite group.

Occurrence: A rare secondary mineral in the oxidized zone of hydrothermal Pb–Zn deposits.

Association: Descloizite, vanadinite, wulfenite, cerussite.

Distribution: Found in the Venus, Agua del Rubio, Bienvenida, Pilar, and Algarrobites mines, El Guaico district, Córdoba Province, Argentina. In the USA, from a prospect in the Swisshelm district, Swisshelm Mountains, Cochise Co., and at the Palmetto mine, Santa Cruz Co., Arizona; on the Hack claim, Paradox Valley, Montrose Co., Colorado. From the Kusu vanadium deposit, 85 km southwest of Kinshasa, Bas-Congo Province, Congo (Bas-Zaire Province, Zaire). In the Mounana uranium mine, Franceville, Gabon.

Name: Honoring Ludwig Brackebusch (1849–1906), Professor of Mineralogy, University of Córdoba, Córdoba, Argentina.

Type Material: The Natural History Museum, London, England, 55819; Harvard University, Cambridge, Massachusetts, USA, 96255.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1052–1053. (2) Berry, L.G. and A.R. Graham (1948) X-ray measurements on brackebuschite and hematolite. *Amer. Mineral.*, 33, 489–495. (3) Donaldson, D.M. and W.H. Barnes (1955) The structures of the minerals of the descloizite and adelite groups: III – brackebuschite. *Amer. Mineral.*, 40, 597–613. (4) Fanfani, L. and P.F. Zanazzi (1967) Structural similarities of some secondary lead minerals. *Mineral. Mag.*, 36, 522–529. (5) Symes, R.F. and S.A. Williams (1973) Heyite and brackebuschite compared. *Mineral. Mag.*, 39, 69–73. (6) Foley, J.A., J.M. Hughes, and D. Lange (1997) The atomic arrangement of brackebuschite, redefined as Pb₂(Mn³⁺, Fe³⁺)(VO₄)₂(OH), and comments on Mn³⁺ octahedra. *Can. Mineral.*, 35, 1027–1033.

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