

Brushite

Ca(HPO₄)•2H₂O

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Crystal Data: Monoclinic. *Point Group:* 2/*m*. Crystals are needlelike, prismatic to tabular {010}, to 2 cm; may be foliated; usually powdery or earthy.

Physical Properties: *Cleavage:* On {010} and {001}, perfect. Hardness = 2.5
D(meas.) = 2.328 D(calc.) = 2.257 Piezoelectric.

Optical Properties: Transparent to translucent. *Color:* Colorless to pale yellow, ivory-yellow; colorless in transmitted light. *Luster:* Vitreous, pearly on cleavages.

Optical Class: Biaxial (+). *Orientation:* Z = b; X ∧ c = -30°. *Dispersion:* r > v, noticeably crossed. α = 1.539–1.540 β = 1.546 γ = 1.551–1.552 2V(meas.) = 59°–90°

Cell Data: *Space Group:* C2/c. a = 6.361(3) b = 15.191(4) c = 5.814(2)
β = 118.45(4)° Z = 4

X-ray Powder Pattern: Pig Hole Cave, Virginia, USA.

7.62 (100), 3.80 (31), 1.90 (10), 3.06 (8), 2.53 (6), 4.27 (2), 2.63 (1)

Chemistry:

	(1)	(2)
P ₂ O ₅	41.41	41.24
CaO	32.69	32.59
H ₂ O	26.36	26.17
Total	100.46	100.00

(1) Aves Island, Venezuela. (2) Ca(HPO₄)•2H₂O.

Occurrence: One of the most common cave minerals, in guano deposits, and in phosphorites, formed at low pH by reaction of phosphate-rich solutions with calcite and clay.

Association: Tanarakite, ardealite, hydroxylapatite, variscite, gypsum.

Distribution: Numerous occurrences. Found on Aves Island, Venezuela, west of Dominica in the Caribbean Sea. From Sombrero Island, West Indies. On Mona Island, Puerto Rico. In the USA, in Pig Hole Cave, Giles Co., Virginia; along Rock Creek, Kankakee Co., Illinois; in Kartchner Cavern, near Benson, Cochise Co., Arizona. Large crystals from Quercy, near Limoges, Haute-Vienne, France. At Schneeberg, Saxony, Germany. From Wheal Cock, St. Just, Cornwall, England. At Oran, Algeria. From the Tsaobismund pegmatite, 60 km south of Karibib, Namibia. In Kyusen-do Cave, Kumamoto Prefecture, Japan. From the Skipton lava tube caves, 40 km southwest of Ballarat, Victoria, Australia. In the Vestfold Hills, East Antarctica.

Name: To honor Professor George Jarvis Brush (1831–1912), American mineralogist, Yale University, New Haven, Connecticut, USA.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 704–706. (2) Murray, J.W. and R.V. Dietrich (1956) Brushite and taranakite from Pig Hole Cave, Giles Co., Virginia. *Amer. Mineral.*, 41, 616–626. (3) Curry, N.A. and D.W. Jones (1971) Crystal structure of brushite, calcium hydrogen orthophosphate dihydrate: a neutron diffraction investigation. *J. Chem. Soc., A*, 3725–3729. (4) Fiore, S. and R. Laviano (1991) Brushite, hydroxylapatite, and taranakite from Apulian caves (southern Italy): new mineralogical data. *Amer. Mineral.*, 76, 1722–1727.