

Billietite**Ba(UO₂)₆O₄(OH)₆•4–8H₂O**

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Crystal Data: Orthorhombic. *Point Group:* *mm*2. Crystals pseudo-hexagonal, tabular on {001}, may be elongated along [110], to 5 mm. *Twinning:* Very common, on {110} and {111}, the latter producing sector-twinned aragonitelike groups.

Physical Properties: *Cleavage:* {001} perfect, {110} and {010} imperfect. *Tenacity:* Brittle. Hardness = n.d. D(meas.) = 5.28–5.36 D(calc.) = 5.27–5.40 Radioactive.

Optical Properties: Transparent to translucent. *Color:* Yellow to golden yellow and amber-yellow. *Luster:* Adamantine.

Optical Class: Biaxial (-). *Pleochroism:* Distinct; X = colorless to pale yellow; Y = Z = greenish yellow to deep golden yellow, amber-brown. *Orientation:* X = c; Y = a; Z = b. *Dispersion:* r > v, very strong. α = 1.725–1.730 β = 1.780–1.822 γ = 1.790–1.829 2V(meas.) = ~36°

Cell Data: *Space Group:* *Pbn*2₁. a = 12.0720(22) b = 30.167(4) c = 7.1455(5) Z = 4

X-ray Powder Pattern: Shinkolobwe, Congo.

7.53 (10), 3.77 (9), 3.17 (8), 2.03 (6), 3.54 (5), 2.49 (4), 2.56 (3)

Chemistry:

	(1)	(2)	(3)
UO ₃	82.76	84.39	86.00
SiO ₂	0.76		
CaO	0.30		
BaO	6.88	7.41	7.68
H ₂ O	8.97	8.68	6.32
Total	99.67	100.48	100.00

(1–2) Shaba Province, Congo. (3) Ba(UO₂)₆O₄(OH)₆•4H₂O.

Occurrence: An uncommon alteration product of uraninite.

Association: Uranophane, fourmarierite, metatorbernite, rutherfordine, becquerelite, studtite, soddyite.

Distribution: From Shinkolobwe and in the Musonoi mine, near Kolwezi, Katanga Province, Congo (Shaba Province, Zaire). From the La Crouzille mine, and the Margnac mine, Compreignac, Haute-Vienne, and in the Rabéjac uranium deposit, seven km south-southeast of Lodève, Hérault, France. In Germany, at Wölsendorf, Bavaria; from Menzenschwand, and at Wittichen, Black Forest; and at Bergen, Vogtland, Saxony. On Mauch Chunk Ridge, Jim Thorpe, Carbon Co., Pennsylvania, and in the Delta mine, Emery Co., Utah, USA.

Name: For Valère Louis Billiet (1903–1945), Belgian crystallographer, University of Ghent, Ghent, Belgium.

Type Material: Harvard University, Cambridge, Massachusetts, 104455; National Museum of Natural History, Washington, D.C., USA, 160496.

References: (1) Vaes, J.F. (1947) Six nouveaux minéraux d'urane provenant de Shinkolobwe (Katanga). Ann. Soc. Géol. Belg., 70, B212–B229, esp. B214–B217 (in French). (2) (1947) Mineral. Abs., 10, 146 (abs. ref. 1). (3) (1948) Amer. Mineral., 33, 384 (abs. ref. 1). (4) Frondel, J.W. and F. Cuttitta (1953) Studies of uranium minerals (XII): the status of billietite and becquerelite. Amer. Mineral., 38, 1019–1024. (5) Frondel, C. (1958) Systematic mineralogy of uranium and thorium. U.S. Geol. Sur. Bull. 1064, 68–72. (6) Christ, C.L. and J.R. Clark (1960) Crystal chemical studies of some uranyl oxide hydrates. Amer. Mineral., 45, 1026–1061. (7) Pagoaga, M.K., D.E. Appleman, and J.M. Stewart (1987) Crystal structure and crystal chemistry of the uranyl oxide hydrates becquerelite, billietite, and protasite. Amer. Mineral., 72, 1230–1238.

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