Giessenite $\mathbf{Pb_{28}Cu_2^{1+}(Bi,Sb)_{19}S_{57}}$

Crystal Data: Monoclinic, pseudo-orthorhombic. *Point Group:* $2/m$. As fine needles, to 1.5 mm. *Twinning:* Intimately on {100}.

Physical Properties: Hardness = ∼2.5 VHN = 65 D(meas.) = n.d. D(calc.) = 7.45

Optical Properties: Opaque. *Color:* Grayish black. *Streak:* Grayish black. *Luster:* Metallic. R_1–R_2: n.d.

Cell Data: *Space Group:* $P2_1/n$. $a = 34.51(3)$ $b = 38.18(5)$ $c = 4.080(8)$ $\beta = 90.33(5)°$ $Z = 2$

X-ray Powder Pattern: Bjørkåsen, Norway.
2.0271 (100), 3.436 (90), 3.404 (90), 2.1514 (90), 2.9061 (70), 2.8867 (70), 2.8413 (70)

Chemistry:

	(1)	(2)	(3)
Pb	47.5	48.3	48.9
Cu	1.2	0.7	0.88
Ag			0.14
Fe			0.09
Bi	29.8	31.7	31.2
Sb	4.2	3.5	3.1
S	16.5	[16.0]	16.4
Total	99.2	[100.2]	[100.71]

(1) Binntal, Switzerland; by electron microprobe, average of three analyses; corresponds to $Pb_{25.88}Cu_{2.13}(Bi_{16.10}Sb_{3.89})_{\Sigma=19.99}S_{58.08}$. (2) Bjørkåsen, Norway; by electron microprobe, average of three analyses, S assumed; corresponds to $Pb_{26.36}Cu_{1.24}(Bi_{17.15}Sb_{3.25})_{\Sigma=20.40}S_{56.41}$. (3) Do.; by electron microprobe, average of eight analyses, original total given as 100.8%; corresponds to $Pb_{26.50}(Cu_{1.55}Fe_{0.18}Ag_{0.15})_{\Sigma=1.88}(Bi_{16.76}Sb_{2.86})_{\Sigma=19.62}S_{57.42}$.

Polymorphism & Series: Forms a series with izoklakeite.

Occurrence: Of hydrothermal origin, with other sulfides.

Association: Galena, pyrite, pyrrhotite, sphalerite, tennantite, seligmannite, geocronite, quartz, dolomite.

Distribution: In Switzerland, from Turtschi, between Giessen and Binn, about 2 km from the Lengenbach quarry, Binntal, Valais [TL]; and at Lake Zervreila, Vals, Graubünden. From the Bjørkåsen sulfide deposit, Otoften, Norway. At the Vena mines, near Askersund, Örebro, Sweden. In the Otome mine, Yamanashi Prefecture, Japan.

Name: For Giessen, a village nearby the Binntal, Switzerland.

Type Material: Natural History Museum, Basel, Switzerland, SG393.

References: (1) Graeser, S. (1963) Giessenit — ein neues Pb–Bi–Sulfosalz aus dem Dolomit des Binnatals. Schweiz. Mineral. Petrog. Mitt., 43, 471–478 (in German with English abs.). (2) (1965) Amer. Mineral., 50, 264 (abs. ref. 1). (3) Graeser, S. and D.C. Harris (1986) Giessenite from Giessen near Binn, Switzerland: new data. Can. Mineral., 24, 19–20. (4) Makovicky, E. and S. Karup-Møller (1986) New data on giessenite from the Bjørkåsen sulfide deposit at Otoften, northern Norway. Can. Mineral., 24, 21–25. (5) Moëlo, Y., G. Roger, D. Maurel-Palacin, E. Marcoux, and A. Loroussi (1995) Chemistry of some Pb-(Cu,Fe)-(Sb,Bi) sulfosalts from France and Portugal. Implications for the crystal chemistry of lead sulfosalts in the Cu-poor part of the Pb_2S_2–Cu_2–Sb_2S_3–Bi_2S_3 system. Mineral. Petrol., 53, 229–250.