Ikunolite $Bi_4(S,Se)_3$

Crystal Data: Hexagonal. *Point Group:* $\overline{3}\,2/m$. Plates, to 3 cm, foliated massive; as minute grains.

Physical Properties: *Cleavage:* {0001}, perfect. *Tenacity:* Very flexible. Hardness = 2 VHN = n.d. D(meas.) = 7.8 D(calc.) = 7.97

Optical Properties: Opaque. *Color:* Lead-gray; in polished section, white with faintly creamy tint. *Streak:* Dark gray. *Luster:* Metallic. *Anisotropism:* Nearly isotropic in basal section, moderately anisotropic, pale gray to gray, in diagonal section.
R_1–R_2: (400) 46.7–48.4, (420) 46.6–48.4, (440) 46.5–48.4, (460) 46.4–48.4, (480) 46.2–48.5, (500) 46.2–48.5, (520) 46.1–48.5, (540) 46.0–48.5, (560) 46.0–48.5, (580) 45.9–48.6, (600) 45.8–48.7, (620) 45.8–48.8, (640) 45.7–48.8, (660) 45.5–48.7, (680) 45.3–48.6, (700) 45.0–48.4

Cell Data: *Space Group:* $R\overline{3}m$. $a = 4.15$ $c = 39.19$ Z = 3

X-ray Powder Pattern: Ikuno mine, Japan.
3.022 (100), 4.34 (50), 2.205 (30), 6.56 (20), 3.536 (20), 2.076 (20), 1.865 (20)

Chemistry:

	(1)	(2)
Bi	79.69	87.9
Se	1.98	4.8
S	8.89	7.4
rem.	[9.44]	
Total	[100.00]	100.1

(1) Ikuno mine, Japan; remainder, by difference, is ferberite and quartz; corresponds to $Bi_{3.78}(S_{2.75}Se_{0.25})_{\Sigma=3.00}$. (2) Ashio mine, Japan; by electron microprobe, corresponds to $Bi_{4.33}(S_{2.38}Se_{0.62})_{\Sigma=3.00}$.

Occurrence: In a quartz vein (Ikuno mine, Japan).

Association: Ferberite, bismuth, bismuthinite, joséite, molybdenite, arsenopyrite, cassiterite, chalcopyrite, quartz (Ikuno mine, Japan).

Distribution: In Japan, from the Ikuno [TL] and Akenobe mines, Hyogo Prefecture, and at the Ashio mine, Tochigi Prefecture. From Kingsgate, New South Wales, Australia. In Sweden, at the Falu mine, Falun, Kopparberg. In the Osikonmaki gold deposit, Rantasalmi, Finland. From the Mullenbach uranium deposit, Black Forest, Germany. In the Vysokogorsk tin deposit, Primorskiy Kray, and from the Kara-Oba Mo–W deposit, Bet-Pak-Dal Desert, central Kazakhstan.

Name: For the Ikuno mine, Japan, where it was first found.

Type Material: National Science Museum, Tokyo, Japan, M15837; The Natural History Museum, London, England.

References: (1) Kato, A. (1959) Ikunolite, a new bismuth mineral from the Ikuno mine, Japan. Mineral. J. (Japan), 2, 397–407. (2) (1960) Amer. Mineral., 45, 477–478. (abs. ref. 1). (3) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 243.