Junoite **$Pb_3Cu_2Bi_8(S,Se)_{16}$**

Crystal Data: Monoclinic. *Point Group:* $2/m$. As tabular crystals, to 150 μm, and irregular grains.

Physical Properties: *Cleavage:* One good. Hardness = n.d. VHN = 114–213
D(meas.) = n.d. D(calc.) = 6.77

Optical Properties: Opaque. *Color:* In polished section, creamy white. *Pleochroism:* Strong, from cream to gray with green and mauve tints. *Anisotropism:* Strong.
R_1–R_2: (400) 34.7–42.8, (420) 34.8–42.7, (440) 35.0–42.5, (460) 35.0–42.5, (480) 35.0–42.5, (500) 34.8–42.4, (520) 34.7–42.7, (540) 34.6–42.2, (560) 34.6–42.3, (580) 34.6–42.5, (600) 34.6–42.7, (620) 34.8–42.8, (640) 34.9–42.6, (660) 35.0–42.4, (680) 35.0–42.1, (700) 35.0–41.9

Cell Data: *Space Group:* $C2/m$. $a = 26.66(1)$ $b = 4.06(1)$ $c = 17.03(1)$ $\beta = 127.20(2)^\circ$
$Z = 2$

X-ray Powder Pattern: Juno mine, Australia.
3.55 (100), 3.90 (80), 2.919 (70), 3.23 (50), 2.970 (50), 3.39 (40), 2.213 (40)

Chemistry:

	(1)	(2)
Pb	19.3	18.8
Cu	4.1	3.9
Ag	0.1	0.4
Bi	54.7	52.3
Se	7.6	14.7
S	13.5	10.1
Total	102.1	100.2

(1) Juno mine, Australia; by electron microprobe, corresponding to $Pb_{2.88}Cu_{1.99}Ag_{0.03}Bi_{8.09}(Se_{2.98}S_{13.02})_{\Sigma=16.00}$. (2) Kidd Creek mine, Canada; by electron microprobe, corresponding to $Pb_{2.89}Cu_{1.86}Ag_{0.12}Bi_{7.99}(Se_{5.94}S_{10.06})_{\Sigma=16.00}$.

Occurrence: Of hydrothermal origin.

Association: Gold, selenian heyrovskýite, krupkaite, proudite, chalcopyrite, magnetite (Juno mine, Australia); chalcopyrite, sphalerite, cobaltite, këesterite, mawsonite (Kidd Creek, Canada); pekoite, tetradymite, aikinite, gladite, cassiterite (Kochbulak deposit, Uzbekistan).

Distribution: From the Juno mine, Tennant Creek, Northern Territory, Australia [TL]. At the Kidd Creek mine, near Timmins, Ontario, Canada. From the Linka mine, Spencer Hot Springs district, Lander Co., Nevada, USA. In the Kochbulak gold deposit, Chatkal-Kuramin Mountains, eastern Uzbekistan. At the Baoshan mine, Hunan Province, and the Funiushan copper skarn deposit, near Nanjing, Jiangsu Province, China. From the Felbertal tungsten mine, Salzburg, Austria.

Name: For the Juno mine, Australia, where it was first found.

Type Material: Geology Department, University of New England, Armidale, Australia, R27790.

References: (1) Mumme, W.G. (1975) Junoite, $Cu_2Pb_3Bi_8(S,Se)_{16}$, a new sulfosalt from Tennant Creek, Australia: its crystal structure and relationship with other bismuth sulfosalts. Amer. Mineral., 60, 548–558. (2) Large, R.R. and W.G. Mumme (1975) Junoite, "wittite" and related seleniferous bismuth sulfosalts from Juno mine, Northern Territory, Australia. Econ. Geol., 70, 369–383. (3) (1975) Amer. Mineral., 60, 737 (abs. ref. 2). (4) Pringle, G.J. and R.I. Thorpe (1980) Bohdanowiczite, junoite and laitakarite from the Kidd Creek mine, Timmins, Ontario. Can. Mineral., 18, 353–360. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 274.