Laitakarite $Bi_4(Se,S)_3$

Crystal Data: Hexagonal. *Point Group:* $\overline{3}\ 2/m$. As foliated plates and sheets, elongated along [001]; as grains, to 2 mm.

Physical Properties: *Cleavage:* {001}, excellent. Hardness = n.d. VHN = 54–78 (100 g load). D(meas.) = 8.12 D(calc.) = [8.28]

Optical Properties: Opaque. *Color:* In polished section, galena-white. *Luster:* Metallic. *Anisotropism:* Moderate, pale brown to dark gray.
R_1–R_2: (400) 50.6–53.8, (420) 50.4–54.0, (440) 50.2–54.2, (460) 50.1–54.5, (480) 49.9–54.6, (500) 49.8–54.6, (520) 49.4–54.6, (540) 49.1–54.6, (560) 48.8–54.6, (580) 48.5–54.6, (600) 48.2–54.5, (620) 47.9–54.4, (640) 47.6–54.0, (660) 47.2–53.5, (680) 46.5–52.9, (700) 45.9–52.3

Cell Data: *Space Group:* $R\overline{3}m$. $a = 4.2239(14)$ $c = 39.94(3)$ $Z = 3$

X-ray Powder Pattern: Orijärvi mine, Finland.
3.072 (100), 2.246 (80), 2.112 (80), 1.741 (70), 4.425 (60), 3.586 (60), 1.538 (60)

Chemistry:

	(1)	(2)		(1)	(2)
Bi	78.28	77.9	Zn	0.14	
Pb	0.78	3.4	Se	15.50	15.4
Ag	0.71		S	3.28	3.3
Cu	0.26		insol.	0.93	
			Total	99.88	100.0

(1) Orijärvi mine, Finland; after deducting 4% of galena, sphalerite, and chalcopyrite this yields $Bi_{3.95}(Se_{2.07}S_{0.93})_{\Sigma=3.00}$. (2) Falun, Sweden; by electron microprobe; corresponds to $(Bi_{3.75}Pb_{0.16})_{\Sigma=3.91}(Se_{1.96}S_{1.04})_{\Sigma=3.00}$.

Occurrence: In veinlets in quartz-anthophyllite-cordierite-biotite rocks (Orijärvi mine, Finland).

Association: Chalcopyrite, bismuth, sphalerite, molybdenite, silver, pyrite, galena (Orijärvi mine, Finland); tetrahedrite–tennantite, luzonite–famatinite, pyrite, mawsonite, nekrasovite, chalcopyrite, emplectite, bismuth, calcite, quartz, barite (Kuramin Mountains, Uzbekistan); nevskite, wolframite, natanite, wittite, selenian bismuthinite, selenian cosalite, cassiterite, guanajuatite (Nevskoye deposit, Russia).

Distribution: In southwestern Finland, from the Orijärvi mine, Orijärvi [TL]. At Falun, Kopparberg, and Boliden, Skellefte district, Sweden. From La Creusaz, Valais, Switzerland. In the Bonser vein, Coniston mines, Cumbria, England. At the Khayragatsch gold deposit, Chatkal-Kuramin Mountains, eastern Uzbekistan. From the Nevsky W–Sn deposit, 25 km northwest of Omsukchan, Magadan region, Russia. In the Akenobe mine, Hyogo Prefecture, Japan. From the Kidd Creek mine, near Timmins, Ontario, Canada. At the Lega Dembi gold deposit, Sidamo Province, Ethiopia.

Name: For Professor Aarne Laitakari (1890–1975), Director, Geological Survey of Finland, who collected the original material.

Type Material: n.d.

References: (1) Vorma, A. (1959) Laitakarite, a new Bi–Se mineral in Orijärvi. Geologi, 3, 11 (in Finnish). (2) (1959) Amer. Mineral., 44, 908 (abs. ref. 1). (3) Vorma, A. (1960) Laitakarite, a new Bi–Se mineral. Bull. Comm. Geol. Finlande, 188, 1–10 (in English). (4) (1962) Amer. Mineral., 47, 806 (abs. ref. 3). (5) Nenasheva, S.N., N.N. Mozgova, Y.S. Borodayev, A.V. Yefimov, and N.I. Organova (1988) Crystal structure of laitakarite as a function of its chemical composition. Doklady Acad. Nauk SSSR, 303, 1468–1472 (in Russian). (6) Bayliss, P. (1991) Crystal chemistry and crystallography of some minerals in the tetradymite group. Amer. Mineral., 76, 257–265. (7) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 309.