

**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$ . Elongated platy crystals, to 1 mm; also fibrous and granular massive.

**Physical Properties:** *Fracture:* Conchoidal. Hardness = 2–3 VHN = n.d.  
D(meas.) = 7.02–7.16 D(calc.) = 7.09

**Optical Properties:** Opaque. *Color:* Steel-gray; in polished section, white. *Streak:* Black. *Luster:* Metallic. *Pleochroism:* Very weak. *Anisotropism:* Distinct.

R: (400) 47.8, (420) 47.0, (440) 46.2, (460) 45.4, (480) 44.7, (500) 44.0, (520) 43.5, (540) 43.1, (560) 42.8, (580) 42.8, (600) 42.8, (620) 42.8, (640) 42.9, (660) 43.0, (680) 43.0, (700) 43.1

**Cell Data:** *Space Group:*  $Bbmm$ .  $a = 13.535(3)$   $b = 20.451(5)$   $c = 4.104(1)$   $Z = 4$

**X-ray Powder Pattern:** Synthetic.

3.52 (100), 2.913 (80), 3.42 (70), 1.777 (70), 3.01 (60), 2.778 (60), 2.070 (60)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
Pb	49.61	45.33	50.45	Bi	31.31	33.97	33.93
Ag	2.17	2.68		Sb	0.57		
Cu	0.14	0.4		S	15.35	15.54	15.62
Fe		0.08		Total	99.15	98.0	100.00

(1) Spokoinoe deposit, Russia; corresponds to  $(\text{Pb}_{3.00}\text{Ag}_{0.25}\text{Cu}_{0.03})_{\Sigma=3.28}(\text{Bi}_{1.88}\text{Sb}_{0.06})_{\Sigma=1.94}\text{S}_{6.00}$ .

(2) Baoshan mine, Hunan Province, China; by electron microprobe, corresponds to  $(\text{Pb}_{2.71}\text{Ag}_{0.31}\text{Cu}_{0.08})_{\Sigma=3.10}\text{Bi}_{2.01}\text{S}_{6.00}$ . (2)  $\text{Pb}_3\text{Bi}_2\text{S}_6$ .

**Polymorphism & Series:** Forms a series with gustavite.

**Occurrence:** In hydrothermal deposits of probable high-temperature origin.

**Association:** At a number of early reported occurrences the “lillianite” was shown to be mixtures, especially of galena and galenobismutite; cosalite, cannizzarite, sphalerite.

**Distribution:** In the USA, the “type locality” [Lillian mine, Leadville, Lake Co., Colorado] has been discredited; found at Twin Lakes, Fresno Co., California. At Yecora, five km west of Iglesia, Sonora, Mexico. From the Ivigtut cryolite deposit, southwestern Greenland. In Russia, at the Spokoinoe and Bukuka tungsten deposits, eastern Transbaikal. From the Kochbulak gold deposit, Chatkal-Kuramin Mountains, eastern Uzbekistan. In Finland, at Jilijärvi, near Orijärvi. From the Felbertal tungsten mine, Salzburg, Austria. Found near Narechenski Basni, southern Rhodope Mountains, Bulgaria. On Vulcano, in the Lipari Islands, Italy. From the Baoshan mine, Hunan Province, China. At the Tsubakihara mine, Gifu Prefecture, Japan. A few additional localities for mixed lillianite–gustavite are known.

**Name:** For the Lillian mine, Leadville, Colorado, USA, the discredited type locality.

**Type Material:** n.d.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana’s system of mineralogy, (7th edition), v. I, 404–406. (2) Syritso, L.F. and V.M. Senderova (1964) The problem of the existence of lillianite. *Zap. Vses. Mineral. Obshch.*, 93, 468–471 (in Russian). (3) Klyakhin, V.A. and M.T. Dmitrieva (1969) New data on synthetic and natural lillianite. *Doklady Acad. Nauk SSSR*, 178, 173–175 (in Russian). (4) Takagi, J. and Y. Takéuchi (1972) The crystal structure of lillianite. *Acta Cryst.*, 28, 649–651. (5) Pring, A., M. Jercher, and E. Makovicky (1999) Disorder and compositional variation in the lillianite homologous series. *Mineral. Mag.*, 63, 917–926. (6) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 321.

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