Berthierite $FeSb_2S_4$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Prismatic crystals elongated and striated ‖ [001], to 1 cm, typically unterminated; fibrous, plumose or radial, brushes to 6 cm; granular, massive.

Physical Properties: *Cleavage:* Prismatic, indistinct. *Tenacity:* Brittle. Hardness = 2–3 VHN = n.d. D(meas.) = 4.64 D(calc.) = 4.68

Optical Properties: Opaque. *Color:* Dark steel-gray, commonly tarnished iridescent or pinchbeck-brown; in polished section, gray. *Streak:* Dark brownish gray. *Luster:* Metallic. *Pleochroism:* Marked. *Anisotropism:* Strong.
R_1–R_2: (400) 32.6–46.2, (420) 32.2–45.9, (440) 31.8–45.5, (460) 31.2–45.0, (480) 30.7–44.4, (500) 30.4–43.8, (520) 30.2–43.1, (540) 30.3–42.5, (560) 30.4–41.9, (580) 30.8–41.4, (600) 31.1–40.8, (620) 31.4–40.3, (640) 31.4–39.9, (660) 31.4–39.4, (680) 31.4–38.9, (700) 31.3–38.4

Cell Data: *Space Group: Pnam.* $a = 11.401(2)$ $b = 14.148(3)$ $c = 3.758(2)$ Z = 4

X-ray Powder Pattern: Synthetic.
2.601 (100), 2.621 (93), 3.663 (92), 2.862 (78), 3.181 (77), 2.999 (52), 3.628 (51)

Chemistry:

	(1)	(2)
Fe	13.43	13.06
Mn	trace	
Sb	56.06	56.95
S	29.46	29.99
insol.	0.33	
Total	99.28	100.00

(1) Herja, Romania; corresponds to $Fe_{1.05}Sb_{2.01}S_{4.00}$. (2) $FeSb_2S_4$.

Occurrence: In low-temperature hydrothermal antimony veins, in portions deficient in sulfur.

Association: Stibnite, arsenopyrite, pyrite, barite, calcite, quartz.

Distribution: Localities are numerous. In France, from Chazelles, Auvergne [TL], Pontgibaud, Puy-de-Dôme, and Valcros, Provence. At Herja (Kisbánya), Baia Mare (Nagybánya) district, and Baia Sprie (Felsőbánya), Romania. From Příbram and Kutná Hora, Czech Republic. At Bräunsdorf, near Freiberg, Saxony, Germany. From Ribnova, southern Rhodope Mountains, Bulgaria. In the Niccioleta mine, Tuscany, Italy. In Mexico, from San Martin, Concepción del Oro, Zacatecas; and from mines near Triunfo, Baja California. At Chashan, Guangxi Province, China. [ck??Japan??]

Name: For Pierre Berthier (1782–1861), French chemist.

Type Material: n.d.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 481–482. (2) Barton, P.B., Jr. (1971) The Fe–Sb–S system. Econ. Geol., 66, 121–132. (3) Lemoine, P., D. Carré, and F. Robert (1991) Structure du sulfure de fer et d'antimoine, $FeSb_2S_4$ (berthiérite). Acta Cryst., C47, 938–940 (in French with English abs.). (4) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 43.