Fettelite $[Ag_6As_2S_7][Ag_{10}HgAs_2S_8]$

Crystal Data: Monoclinic, pseudohexagonal. *Point Group*: 2, pseudo $\bar{3}$ 2/*m*. As hexagonal tablets and flakes, to 1 cm, in subparallel aggregates, rosettelike groups, and clusters. *Twinning*: Six twin domains revealed by structure analysis.

Physical Properties: *Cleavage*: Perfect on {0001}. *Tenacity*: Brittle. *Fracture*: Irregular to subconchoidal. Hardness = 3.75 VHN = 138-174, 158 average (20 g load). D(calc.) = 6.29

Optical Properties: Opaque. *Color*: Dark violet to scarlet, wine-red in thin fragments; in reflected light, gray with a greenish tint, with strong red internal reflections. *Streak*: Dark vermillion. *Luster*: Submetallic to metallic to adamantine.
Optical Class: Biaxial. *Anisotropism*: Weak; bright greenish gray to dark bluish gray.
Bireflectance: Weak, white to brownish gray.
R_1-R_2: (400) — , (420) 30.7-31.3, (440) 30.7-31.3, (460) 30.5-31.1, (480) 30.0-30.8, (500) 29.4-30.3, (520) 28.6-29.8, (540) 27.6-29.2, (560) 27.1-28.6, (580) 26.0-27.6, (600) 25.7-27.1, (620) 25.0-26.3, (640) 24.3-25.4, (660) 23.6-24.5, (680) 23.0-23.8, (700) 22.5-23.3

Cell Data: *Space Group*: *C*2. a = 26.0388(10) b = 15.0651(8) c = 15.5361(8) β = 90.48(1)° Z = 8

X-ray Powder Pattern: Glasberg quarry, Germany.
3.091 (10), 1.878 (8), 3.175 (6), 2.998 (4), 2.755 (3), 3.243 (2), 2.497 (2)

Chemistry:

	(1)	(2)
Tl	0.13	0.07
Hg	5.21	7.19
Ag	67.55	62.78
Pb	0.07	0.15
Cu	0.07	0.09
Fe	0.04	0.02
As	9.80	10.01
Sb	0.23	1.56
S	16.79	17.60
Total	99.88	99.47

(1) Glasberg quarry, Germany; by electron microprobe, average of 28 analyses on five crystals; corresponds to $Ag_{17.19}Cu_{0.03}Pb_{0.01}Fe_{0.02}Tl_{0.02}Hg_{0.71}As_{3.59}Sb_{0.05}S_{14.38}$. (2) Chañarcillo, Copiapó Province, Chile; average electron microprobe analysis; corresponds to $(Ag_{15.92}Cu_{0.04}Pb_{0.02}Fe_{0.01}Tl_{0.01})_{\Sigma=16.00}Hg_{0.98}(As_{3.65}Sb_{0.35})_{\Sigma=4.00}S_{15.02}$.

Occurrence: A rare mineral in low-temperature hydrothermal, silver-sulfosalt veins.

Association: Proustite, pearceite, xanthoconite, safflorite.

Distribution: From the Glasberg quarry, Nieder-Beerbach, 10 km south of Darmstadt, Odenwald, Hesse, Germany [TL]. At Chañarcillo, Copiapó Province, Chile.

Name: Honors M. *Fettel*, a field geologist who first noted the mineral.

Type Material: Institute of Mineralogy, University of Heidelberg, Heidelberg, Germany.

References: (1) Wang, N. and A. Paniagua (1996) Fettelite a new Hg-sulfosalt mineral from Odenwald. Neues Jahrb. Mineral., Monatsh., 313-320. (2) (1997) Amer. Mineral., 82, 621 (abs. ref. 1). (3) Bindi, L., F.N. Keutsch, C.A. Francis, and S. Menchetti (2009) Fettelite, $[Ag_6As_2S_7][Ag_{10}HgAs_2S_8]$ from Chañarcillo, Chile: Crystal structure, pseudosymmetry, twinning, and revised chemical formula. Amer. Mineral., 94, 609-615. (4) Bindi, L. and S. Menchetti (2011) Fast ion conduction character and ionic phase-transition in silver sulfosalts: The case of fettelite $[Ag_6As_2S_7][Ag_{10}HgAs_2S_8]$. Amer. Mineral., 96, 792-796.