Gillulyite $Tl_2(As,Sb)_8S_{13}$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Rarely as prismatic crystals, to 2 mm, showing {110}, {010}, and {011}; in cleavable masses.

Physical Properties: *Cleavage:* Perfect on {001}. Hardness = 2–2.5 VHN = 87–132, 108 average (25 g load). D(meas.) = 4.02 D(calc.) = 4.14

Optical Properties: Opaque, translucent in thin fragments. *Color:* Deep red to maroon, tarnishing to darker red or blue; pale gray in reflected light, with abundant deep red internal reflections. *Streak:* Bright brick-red. *Luster:* Vitreous to metallic if tarnished.
Optical Class: Biaxial. *Anisotropism:* Distinct. *Bireflectance:* Weak to moderate in oil; pale rose to dusky rose.
R_1–R_2: (400) 29.8–32.0, (420) 29.3–31.8, (440) 28.6–31.6, (460) 27.8–31.0, (480) 27.3–30.6, (500) 27.0–30.4, (520) 26.1–29.6, (540) 25.1–28.9, (560) 23.6–27.5, (580) 23.1–26.9, (600) 22.6–26.2, (620) 22.2–25.8, (640) 21.9–25.4, (660) 21.6–25.2, (680) 21.4–24.9, (700) 21.2–24.8

Cell Data: *Space Group:* $P2/n$. $a = 9.584(3)$ $b = 5.679(2)$ $c = 21.501(6)$ $\beta = 10.07(2)^\circ$ $Z = 2$

X-ray Powder Pattern: Mercur deposit, Utah, USA.
3.077 (100), 2.814 (100), 3.63 (90), 2.502 (70), 1.766 (70), 4.14 (60), 3.87 (60)

Chemistry:

	(1)
Tl	28.4
As	39.3
Sb	2.2
S	28.7
Total	98.6

(1) Mercur deposit, Utah, USA; by electron microprobe, average of five analyses; corresponding to $Tl_{2.02}As_{7.62}Sb_{0.26})_{\Sigma=7.88}S_{13.00}$.

Occurrence: In a sediment-hosted disseminated gold deposit, in organic-rich unoxidized carbonates.

Association: Orpiment, realgar, lorandite, raguinite, pyrite, barite, calcite.

Distribution: From the Mercur gold deposit, southern Oquirrh Mountains, about 56 km southwest of Salt Lake City, Tooele Co., USA [TL].

Name: To honor James C. Guilluly (1896–1980), U.S. Geological Survey, who worked in the area of the Mercur deposit.

Type Material: Royal Ontario Museum, Toronto, Canada; Harvard University, Cambridge, Massachusetts, 130781; National Museum of Natural History, Washington, D.C., USA, 170773.

References: (1) Wilson, J.R., P.D. Robinson, P.N. Wilson, L.W. Stanger, and G. L. Salmon (1991) Gillulyite, $Tl_2(As,Sb)_8S_{13}$, a new thallium arsenic sulfosalt from the Mercur gold deposit, Utah. Amer. Mineral., 76, 653–656. (2) Wilson, J.R., P.K. Sen Gupta, P.D. Robinson, and A.J. Criddle (1993) Fangite, Tl_3AsS_4, a new thallium arsenic sulfosalt from the Mercur Au deposit, Utah, and revised optical data for gillulyite. Amer. Mineral., 78, 1096–1103. (3) Foit, F.F., Jr., P.D. Robinson, and J.R. Wilson (1995) The crystal structure of gillulyite, $Tl_2(As,Sb)_8S_{13}$, from the Mercur gold deposit, Tooele County, Utah, U.S.A. Amer. Mineral., 80, 394–399.
(4) Makovicky, E. and T. Balič-Žunić (1999) Gillulyite $Tl_2(As,Sb)_8S_{13}$: reinterpretation of the crystal structure and order-disorder phenomena. Amer. Mineral., 84, 400–406.