Rathite $(Pb, Tl)_3As_5S_{10}$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals prismatic to short prismatic and striated parallel to [100]. size??ckBinnbooks??MinSchweiz?? *Twinning:* Polysynthetic on {001}, producing crystals of pseudo-orthorhombic habit; commonly seen in polished section.

Physical Properties: *Cleavage:* Perfect on {001}; parting on {010}. *Fracture:* Subconchoidal. Hardness = 3 VHN = 161 D(meas.) = 5.37(4) D(calc.) = 5.31

Optical Properties: Not fully opaque. ??ckBinnbooks??MinSchweiz?? *Color:* Lead-gray, may tarnish to iridescence; in polished section, white with deep red internal reflections. *Streak:* Chocolate-brown. *Luster:* Metallic. *Pleochroism:* Strong. *Anisotropism:* Intense; olive-green or yellow and bluish violet.

R_1–R_2: (400) 40.0–45.2, (420) 39.2–44.8, (440) 38.4–44.3, (460) 37.8–43.7, (480) 37.2–43.7, (500) 36.6–42.8, (520) 36.0–42.3, (540) 35.4–41.8, (560) 34.7–41.0, (580) 34.0–40.2, (600) 33.3–39.3, (620) 32.6–38.4, (640) 31.9–37.6, (660) 31.3–36.7, (680) 30.7–35.9, (700) 30.2–35.2

Cell Data: *Space Group:* $P2_1/c$. $a = 8.496(1)$ $b = 7.969(1)$ $c = 25.122(3)$ $\beta = 100.704(2)^\circ$ Z = 4

X-ray Powder Pattern: Binntal, Switzerland.
2.75 (100), 3.60 (80), 3.39 (70), 2.87 (70), 4.19 (60), 2.97 (60), 2.22 (50)

Chemistry:

	(1)	(2)
Pb	41.2	36.61
Tl	3.6	5.36
Ag		4.13
As	27.0	27.31
Sb		1.94
S	28.	24.48
Total	99.8	99.82

(1) Binntal, Switzerland; by electron microprobe, corresponds to $(Pb_{2.78}Tl_{0.22})_{\Sigma=3.00}Ag_{0.58}As_{4.40}S_{10.00}$. (2) Do.; by electron microprobe, average of 11 analyses; corresponds to $(Pb_{2.31}Tl_{0.34})_{\Sigma=2.65}Ag_{0.50}(As_{4.77}Sb_{0.21})_{\Sigma=4.98}S_{10.00}$.

Occurrence: In crystalline dolostone with other Pb–As–S minerals.

Association: Liveingite, baumhauerite, sartorite, hutchinsonite, tennantite, pyrite.

Distribution: From the Lengenbach quarry, Binntal, Valais, Switzerland [TL].

Name: In honor of Gerhard von Rath (1830–1888), Professor of Mineralogy, Bonn, Germany.

Type Material: University of Fribourg, Fribourg, Switzerland, B742.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 455–457. (2) Marumo, F. and W. Nowacki (1965) The crystal structure of rathite-I. Zeits. Krist., 122, 433–456. (3) Berlepsch, P., T. Armbruster, and D. Topa (2002) Structural and chemical variations in rathite, $Pb_8Pb_{4-x}(Tl_2As_2)_x(Ag_2As_2)As_{16}S_{40}$: modulations of a parent structure. Zeits. Krist., 217, 581–590. (4) Berry, L.G. and R.M. Thompson (1962) X-ray powder data for the ore minerals. Geol. Soc. Amer. Mem. 85, 152–153. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 475.