Hutchinsonite $(Pb,Tl)_2As_5S_9$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals are prismatic to acicular ‖ [001], to 1 cm; also as radiating tufts.

Physical Properties: *Cleavage:* Good on {010}. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 1.5–2 VHN = 170 D(meas.) = 4.6–4.7 D(calc.) = 4.58

Optical Properties: Opaque, translucent in thin fragments. *Color:* Scarlet-vermilion to deep cherry-red, with strong red internal reflections; transmits red light in thin fragments. *Luster:* Adamantine to submetallic.
Optical Class: Biaxial (–). *Orientation:* $X = a$; $Y = b$; $Z = c$. *Dispersion:* $r < v$, extreme. $\alpha = 3.078(18)$ $\beta = 3.176(3)$ $\gamma = 3.188(3)$ 2V(meas.) = 37° (589). *Anisotropism:* Strong. R_1–R_2: (400) 32.6–36.9, (420) 31.8–35.9, (440) 31.2–35.2, (460) 30.5–34.3, (480) 29.5–33.2, (500) 29.0–32.1, (520) 29.1–31.3, (540) 28.8–30.4, (560) 28.0–29.4, (580) 26.9–28.4, (600) 26.0–27.6, (620) 25.3–26.8, (640) 24.8–26.4, (660) 24.3–26.0, (680) 23.9–25.6, (700) 23.6–25.3

Cell Data: *Space Group: Pbca.* $a = 1.809(6)$ $b = 35.48(1)$ $c = 8.167(3)$ $Z = 8$

X-ray Powder Pattern: Binntal, Switzerland.
2.74 (100), 3.79 (70), 3.05 (60), 4.44 (50), 2.39 (30), 2.22 (30), 1.907 (30)

X-ray Powder Pattern: Quiruvilca, Peru. (ICDD 42-1388).
17.5 (100), 3.050 (100), 3.701 (80), 2.700 (70), 5.34 (60), 4.37 (60), 3.819 (60)

Chemistry:

	(1)	(2)	(3)
Pb	12.5	19.3	19.28
Tl	25.0	17.3	19.02
Ag	9.0	0.0	
As	30.5	31.1	34.85
Sb		1.9	
S	26.0	29.3	26.85
Total	103.0	98.9	100.00

(1) Binntal, Switzerland. (2) Quiruvilca, Peru; by electron microprobe, corresponds to $Pb_{0.98}Tl_{0.89}(As_{4.36}Sb_{0.17})_{\Sigma=4.53}S_{9.61}$. (3) $PbTlAs_5S_9$.

Occurrence: Of hydrothermal origin.

Association: Orpiment, realgar, getchellite, pyrite, sphalerite, hatchite, jentschite, sicherite, edenharterite, bernardite, stalderite, ernigglite, chabournite.

Distribution: In Switzerland, from the Lengenbach quarry, Binntal, Valais [TL]. At the Segen Gottes mine, near Wiesloch, Black Forest, Germany. Very well crystallized from the La Libertad mine, Quiruvilca, Peru. At the Toya-Takarada mine, Hokkaido, Japan. From the Nanhua Sn–Tl deposit, Yunnan Province, China.

Name: To honor Arthur Hutchinson (1866–1937), Professor of Mineralogy, Cambridge University, Cambridge, England.

Type Material: n.d.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 468–469. (2) Takéuchi, Y., S. Ghose, and W. Nowacki (1965) The crystal structure of hutchinsonite, $(Tl,Pb)_2As_5S_9$. Zeits. Krist., 121, 321–348. (3) White, J.S. and J.A. Nelen (1985) Hutchinsonite from Quiruvilca, Peru. Mineral. Record, 16, 459–460. (??)?? Matsushita, ?? and ?? Takéuchi (1994) ??title?? Zeits. Krist., 209, 475–?? must, and renumber; (4) Berry, L.G. and R.M. Thompson (1962) X-ray powder data for the ore minerals. Geol. Soc. Amer. Mem. 85, 160–161. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 242.