Chrisstanleyite $Ag_2Pd_3Se_4$

Crystal Data: Monoclinic. *Point Group:* $2/m$ or 2. Anhedral crystals, to several hundred μm, aggregated in grains. *Twinning:* Fine polysynthetic and parquetlike, characteristic.

Physical Properties: *Tenacity:* Slightly brittle. Hardness = ∼5 VHN = 371–421, 395 average (100 g load), D(meas.) = n.d. D(calc.) = 8.30

Optical Properties: Opaque. *Color:* Silvery gray. *Streak:* Black. *Luster:* Metallic. *Optical Class:* Biaxial. *Pleochroism:* Slight; pale buff to slightly gray-green buff. *Anisotropism:* Moderate; rose-brown, gray-green, pale bluish gray, dark steel-blue. *Bireflectance:* Weak to moderate.
R_1–R_2: (400) 35.6–43.3, (420) 36.8–44.2, (440) 37.8–45.3, (460) 39.1–46.7, (480) 40.0–47.5, (500) 41.1–48.0, (520) 42.1–48.5, (540) 42.9–48.7, (560) 43.5–49.1, (580) 44.1–49.3, (600) 44.4–49.5, (620) 44.6–49.6, (640) 44.5–49.3, (660) 44.4–49.2, (680) 44.2–49.1, (700) 44.0–49.0

Cell Data: *Space Group:* $P2_1/m$ or $P2_1$. $a = 6.350(6)$ $b = 10.387(4)$ $c = 5.683(3)$ $\beta = 114.90(5)^\circ$ Z = 2

X-ray Powder Pattern: Hope's Nose, England.
2.742 (100), 1.956 (100), 2.688 (80), 2.868 (50b), 2.367 (50), 1.829 (30), 2.521 (20)

Chemistry:

	(1)	(2)	(3)
Pd	37.64	35.48	37.52
Pt		0.70	
Hg		0.36	
Ag	25.09	24.07	25.36
Cu	0.18	2.05	
Se	36.39	38.50	37.12
Total	99.30	101.16	100.00

(1) Hope's Nose, England; by electron microprobe, average of 26 analyses; corresponding to $(Ag_{2.01}Cu_{0.02})_{\Sigma=2.03}Pd_{3.02}Se_{3.95}$. (2) Copper Hills prospect, Australia; by electron microprobe, corresponding to $(Ag_{1.86}Cu_{0.27}Hg_{0.02})_{\Sigma=2.15}(Pd_{2.77}Pt_{0.03})_{\Sigma=2.80}Se_{4.06}$. (3) $Ag_2Pd_3Se_4$.

Occurrence: In gold-bearing calcite veins in limestone (Hope's Nose, England); in a carbonate matrix (Tilkerode, Germany); in malachite nodules (Copper Hills prospect, Australia).

Association: Gold, fischesserite, clausthalite, tiemannite, eucairite, verbeekite, umangite, cerussite, bromian chlorargyrite (Hope's Nose, England); clausthalite, tischendorfite, tiemannite, stibiopalladinite, gold (Tilkerode, Germany); oosterboschite, naumannite, berzelianite, umangite, tiemannite, chalcomenite, malachite, quartz (Copper Hills prospect, Australia).

Distribution: From Hope's Nose, Torquay, Devon, England [TL]. At Tilkerode, Harz Mountains, Germany. In the Copper Hills prospect, East Pilbara region, Western Australia.

Name: In honor of Dr. Chris J. Stanley (1954–), The Natural History Museum, London, England, for his contributions to ore mineralogy.

Type Material: Institute for Mineralogy, Salzburg University, Salzburg, Austria, II/A 1070; The Natural History Museum, London, England, 1997,59, E1527, E1534, E1537, E1538.

References: (1) Paar, W.H., A.C. Roberts, A.J. Criddle, and D. Topa (1998) A new mineral, chrisstanleyite, $Ag_2Pd_3Se_4$, from Hope's Nose, Torquay, Devon, England. Mineral. Mag., 62, 257–264. (2) (1998) Amer. Mineral., 83, 1348 (abs. ref. 1). (3) Nickel, E.H. (2002) An unusual occurrence of Pd, Pt, Au, Ag and Hg minerals in the Pilbara region of Western Australia. Can. Mineral., 40, 419–433.