Niggliite PtSn

Crystal Data: Hexagonal. *Point Group:* $6/m\ 2/m\ 2/m$. As rounded to anhedral inclusions, to 75 μm.

Physical Properties: *Tenacity:* Brittle. Hardness = n.d. VHN = 572–612, average 595; 642–673, average 663 (25 g load). D(meas.) = n.d. D(calc.) = 13.4

Optical Properties: Opaque. *Color:* Silver-white; in reflected light, pinkish to blue. *Luster:* Metallic. *Bireflectance:* Strong, from pinkish cream to pale cobalt-blue. *Anisotropism:* Very high, bright pinkish cream to very dark blue or black.
R_1–R_2: (400) 42.6–46.4, (420) 43.9–50.0, (440) 44.7–52.9, (460) 45.6–55.7, (480) 45.9–58.2, (500) 46.0–60.0, (520) 45.9–61.7, (540) 45.6–63.0, (560) 45.3–64.1, (580) 45.0–65.0, (600) 44.8–66.0, (620) 44.6–66.6, (640) 44.6–67.1, (660) 44.6–67.6, (680) 44.7–68.2, (700) 45.0–68.5

Cell Data: *Space Group:* $P6_3/mmc$ (synthetic). $a = 4.100(1)$ $c = 5.432(2)$ $Z = 2$

X-ray Powder Pattern: Synthetic.
2.157 (100), 0.781 (100), 1.203 (90), 2.050 (80), 1.485 (80), 0.7758 (80), 2.971 (70)

Chemistry:

	(1)	(2)	(3)
Pt	61.0	61.1	62.17
Pd		0.38	
Sn	31.4	36.7	37.83
Sb	4.7	1.05	
Bi	2.2	0.35	
Te		0.08	
Total	99.3	99.66	100.00

(1) Insizwa deposit, South Africa; by electron microprobe, corresponding to $Pt_{1.00}(Sn_{0.85}Sb_{0.12}Bi_{0.04})_{\Sigma=1.01}$. (2) Sudbury, Canada; by electron microprobe, corresponding to $(Pt_{0.98}Pd_{0.01})_{\Sigma=0.99}(Sn_{0.97}Sb_{0.03}Bi_{0.01})_{\Sigma=1.01}$. (3) PtSn.

Mineral Group: Nickeline group.

Occurrence: In late-forming hydrothermal veins.

Association: Pentlandite, chalcopyrite, bornite, parkerite, insizwaite, cubanite, pyrrhotite (Insizwa deposit, South Africa); stannopalladinite, hessite, platinum and palladium tellurides (Monchegorsk, Russia); froodite (Sudbury, Canada); leadamalgam, chromite, ilmenite, magnetite, gersdorffite, pyrite, chalcopyrite, violarite, millerite, galena, stibnite, argentian gold, sperrylite, iridosmine, platinum, merenskyite, kotulskite (Shiaonanshan, China).

Distribution: From the Insizwa Cu–Ni deposit, Waterfall Gorge, Eastern Cape, South Africa [TL]. At Monchegorsk, Kola Peninsula, and the Talnakh area, Noril'sk region, western Siberia, Russia. In China, From Shiaonanshan, Inner Mongolia. At the Szklary serpentinite massif, Poland. In the Strathcona mine, Sudbury, Ontario, Canada. From Fox Gulch, Goodnews Bay, Alaska, USA.

Name: In honor of Professor Paul Niggli (1888–1953), Swiss mineralogist, University of Zurich, Zurich, Switzerland.

Type Material: National Museum of Natural History, Washington, D.C., USA, 162610.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 347. (2) Cabri, L.J. and D.C. Harris (1972) The new mineral insizwaite ($PtBi_2$) and new data on niggliite (PtSn). Mineral. Mag., 38, 794–800. (3) Yushko-Zakharova, O.E. and A. Chernaev (1966) The composition and properties of niggliite from copper-nickel ores of the Monchegorsk deposit. Doklady Acad. Nauk SSSR, 170, 148–150 (in English). (4) Cabri, L.J., Ed. (1981) Platinum group elements: mineralogy, geology, recovery. Can. Inst. Min. & Met., 121–122, 164. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 395.