Thalhammerite $Pd_9Ag_2Bi_2S_4$

Crystal Data: Tetragonal. *Point Group*: 4/*m* 2/*m* 2/*m*. As inclusions to 50 μm.

Physical Properties: *Cleavage*: n.d. *Fracture*: n.d. *Tenacity*: Brittle. Hardness = n.d. D(calc.) = 9.72

Optical Properties: Opaque. *Color*: n.d.; light yellow in reflected light. S*treak*: n.d. *Luster*: Metallic.
Optical Class: *Anisotropism*: Weak. *Bireflectance*: Weak. *Pleochroism*: Weak, shades of slightly yellowish brown.
R_1-R_2: (400) 40.0-41.2, (420) 40.6-41.8, (440) 41.1-42.3, (460) 41.7-42.8, (470) 41.9-43.0, (480) 42.2-43.3, (500) 42.7-43.9, (520) 43.2-44.4, (540) 43.7-44.9, (546) 43.9-45.1, (560) 44.2-45.4, (580) 44.7-45.9, (589) 44.9-46.1, (600) 45.2-46.3, (620) 45.6-46.8, (640) 46.1-47.3, (650) 46.3-47.5, (660) 46.5-47.8, (680) 47.0-48.3, (700) 47.4-48.9

Cell Data: Space Group: *I*4/*mmm*. a = 8.0266(2) c = 9.1531(2) Z = 2

X-ray Powder Pattern: Komsomolsky mine, Noril'sk region, Russia.
2.412 (100), 2.325 (61), 2.287 (48), 2.839 (46), 2.007 (40), 1.509 (30), 2.220 (29)

Chemistry:

	(1)	(2)
Pd	52.61	55.69
Bi	22.21	24.30
Pb	3.92	
Ag	14.37	12.54
S	7.69	7.46
Se	0.10	.
Total	100.90	99.99

(1) Komsomolsky mine, Noril'sk region, Russia; average of 3 electron microprobe analyses supplemented by Raman spectroscopy; corresponds to $Pd_{8.46}Ag_{2.28}(Bi_{1.82}Pb_{0.32})_{\Sigma=2.14}(S_{4.10}Se_{0.02})_{\Sigma=4.12}$.
(2) $Pd_9Ag_2Bi_2S_4$.

Occurrence: In vein-disseminated galena-pyrite-chalcopyrite and millerite-bornite-chalcopyrite deposits hosted by diopside-hydrogrossular metasomatites developed in diopside-monticellite skarns (Komsomolsky mine); in PGE ores in a layered intrusive (Fedorov-Pana intrusive).

Association: Braggite, vysotskite, stibiopalladinite, telargpalite, sobolevskite, kotulskite, sopcheite, moncheite, malyshevite, insizwaite, acanthite, aurian silver, kravtsovite, vymazalváite, galena, chalcopyrite, bornite, millerite, pyrite.

Distribution: From the Komsomolsky mine, Talnakh and Oktyabrsk deposits, Noril'sk region, and the Fedorov-Pana layered intrusive, Russia.

Name: Honors Associate Professor Oskar Thalhammer (b. 1956), University of Leoben, Austria, for his contributions to understanding the ore mineralogy and deposits of platinum group elements.

Type Material: Department of Earth Sciences, Natural History Museum, London, England (BM 2016, 150).

References: (1) Vymazalová, A., F. Laufek, S.F. Sluzhenikin, V.V. Kozlov, C.J. Stanley, J. Plášil, F. Zaccarini, G. Garuti, and R. Bakker (2018) Thalhammerite, $Pd_9Ag_2Bi_2S_4$, a new mineral from the Talnakh and Oktyabrsk Deposits, Noril'sk Region, Russia. Minerals, 8(8), 339. (2) (2020) Amer. Mineral., 105(8), 1282-1283 (abs. ref. 1).