

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals, to 2 mm, tabular on {001}; in rounded grains, also massive and in dendrites.

Physical Properties: *Cleavage:* {001}, perfect. Hardness = ~ 5 VHN = 681–830 (100 g load). D(meas.) = 7.12 D(calc.) = 7.24

Optical Properties: Opaque. *Color:* Tin-white. *Luster:* Metallic. *Anisotropism:* Strong, in russet-brown, brown, yellow, gray.

R₁–R₂: (400) 57.3–57.7, (420) 57.7–57.9, (440) 58.1–58.1, (460) 58.6–58.4, (480) 58.9–58.7, (500) 59.1–59.0, (520) 59.1–59.2, (540) 59.0–59.6, (560) 58.8–60.0, (580) 58.7–60.4, (600) 58.5–60.7, (620) 58.2–60.9, (640) 58.0–61.1, (660) 57.8–61.2, (680) 57.6–61.3, (700) 57.4–61.3

Cell Data: *Space Group:* *Pcba*. $a = 5.753$ $b = 5.799$ $c = 11.407$ $Z = 8$

X-ray Powder Pattern: Synthetic.

2.559 (100), 2.521 (95), 2.371 (65), 2.337 (65), 1.741 (65), 2.855 (50), 2.827 (50)

Chemistry:	(1)	(2)	(3)
Ni	28.1	25.79	28.15
Co	0.4	1.26	
Cu		0.77	
As	68.5	71.23	71.85
S	2.6	0.02	
Total	99.6	99.07	100.00

(1) Moose Horn mine, Canada; corresponds to $(\text{Ni}_{0.96}\text{Co}_{0.01})_{\Sigma=0.97}(\text{As}_{1.84}\text{S}_{0.16})_{\Sigma=2.00}$.

(2) Černý Důl mine, Czech Republic; by electron microprobe, corresponds to $(\text{Ni}_{0.92}\text{Co}_{0.04}\text{Cu}_{0.02})_{\Sigma=0.98}\text{As}_{2.00}$. (3) NiAs₂.

Polymorphism & Series: Trimorphous with rammelsbergite and krutovite.

Occurrence: In hydrothermal veins bearing Ni–Co sulfide mineralization.

Association: Nickeline, skutterudite, cobaltite, löllingite, gersdorffite, rammelsbergite.

Distribution: In Canada, in Ontario, from the Moose Horn mine, Elk Lake, Gowganda [TL]; at the Hudson Bay [TL] and other mines in Cobalt; and from the Keeley mine, South Lorrain Township [TL]; at the D uranium deposit, Saskatchewan; on the Camsell River, six km south of Conjuror Bay, in the Great Bear Lake silver deposits, Northwest Territories. At Franklin, Sussex Co., New Jersey, USA. From Dobšiná (Dobschau), Slovakia. At the Černý Důl mine, Krkonoše (Giant Mountains), Czech Republic. In Germany, from Bieber, near Hanau, and in the Steinbruch quarry, Keimberg, near Wolfhagen, Hesse. At the San Juan de Plan mine, Gistain, Huesca Province, Spain. In the Shorbulaksk mercury deposit, Azerbaijan. At Bou Azzer, Morocco. In the Talmessi and Meskani mines, Anarak district, Iran.

Name: For its chemical similarity to rammelsbergite.

Type Material: Royal Ontario Museum, Toronto, Canada, M12411, M11772, M14242.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 310–311. (2) Fleet, M.E. (1972) The crystal structure of pararammelsbergite. *Amer. Mineral.*, 57, 1–9. (3) Johan, Z. (1985) The Černý Důl deposit (Czechoslovakia): an example of Ni-, Fe-, Ag-, Cu-arsenide mineralization with extremely high activity of arsenic; new data on paxite, novakite and kutinaite. *Tschermaks Mineral. Petrog. Mitt.*, 34, 167–182. (4) Bennett, S.L. and R.D. Heyding (1966) Arsenides of the transition metals. *Can. J. Chem.*, 44, 3017–3030. (5) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 416.

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