Krutovite $NiAs_2$

Crystal Data: Cubic. *Point Group:* 23. As grains, to 0.1 mm, in close intergrowth with other sulfides.

Physical Properties: Hardness = 5.5 VHN = 624–633; 645–760, 719 average. D(meas.) = n.d. D(calc.) = [7.08–7.12]

Optical Properties: Opaque. *Color:* Pale gray, paler than associated nickel-skutterudite; in polished section, bright white with a rose tint. *Luster:* Metallic.
R: (400) — , (420) — , (440) 66.2, (460) 65.4, (480) — , (500) 64.0, (520) — , (540) 64.7, (560) — , (580) 65.7, (600) — , (620) 66.7, (640) — , (660) 66.8, (680) — , (700) 66.8

Cell Data: *Space Group:* $P2_13$. $a = 5.786–5.794$ $Z = 4$

X-ray Powder Pattern: Jáchymov, Czech Republic.
2.593 (10), 2.365 (8), 1.746 (8), 2.897 (6), 1.548 (6), 1.0242 (6), 2.051 (5)

Chemistry:

	(1)	(2)	(3)	(4)
Ni	24.98	26.74	25.04	28.15
Co	0.22	0.30	1.65	
Fe	0.15	0.21	0.26	
Cu	0.86	0.85		
As	73.37	71.94	72.37	71.85
Sb			0.08	
S	0.19	0.15	0.02	
Total	99.65	100.19	99.42	100.00

(1) Jáchymov, Czech Republic; by electron microprobe, average of 32 analyses; corresponds to $(Ni_{0.87}Cu_{0.03}Co_{0.01})_{\Sigma=0.91}As_{2.00}$. (2) Do.; by electron microprobe, average of 31 analyses; corresponds to $(Ni_{0.94}Cu_{0.03}Co_{0.01}Fe_{0.01})_{\Sigma=0.99}(As_{1.99}S_{0.01})_{\Sigma=1.00}$. (3) Khovu-Aksy deposit, Russia; by electron microprobe, average of 10 analyses; corresponds to $(Ni_{0.88}Co_{0.03}Fe_{0.01})_{\Sigma=0.92}As_{2.00}$. (4) $NiAs_2$.

Polymorphism & Series: Trimorphous with rammelsbergite and pararammelsbergite.

Occurrence: In Co–Ni–As sulfide veins of hydrothermal origin.

Association: Nickel-skutterudite, tennantite (Jáchymov, Czech Republic); nickeline, breithauptite, löllingite, nickel-skutterudite, rammelsbergite, pararammelsbergite, silver (Khovu-Aksy deposit, Russia).

Distribution: From the Geshiber vein, Jáchymov (Joachimsthal), Czech Republic [TL]. At the Khovu-Aksy Ni–Co deposit, Tuva, Siberia, Russia.

Name: For Georgi Alekseevich Krutov (1902–1989), Professor of Mineralogy, Moscow State University, Moscow, Russia.

Type Material: National Museum, Prague, Czech Republic, 61625; Mining Institute, St. Petersburg; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia.

References: (1) Vinogradova, R.A., N.S. Rudashevskii, I.A. Bud'ko, L.I. Bochek, P. Kaspar, and K. Padera (1976) Krutovite – a new cubic nickel diarsenide. Zap. Vses. Mineral. Obshch., 105, 59–71 (in Russian). (2) (1977) Amer. Mineral., 62, 173–174 (abs. ref. 1). (3) Vinogradova, R.A., N.S. Rudashevskii, L.I. Bochek, and I.A. Bud'ko (1976) First discovery of krutovite in the USSR. Doklady Acad. Nauk SSSR, 230, 938–941 (in Russian).