

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As prismatic crystals to 0.3 mm.

Physical Properties: *Cleavage:* None. *Fracture:* Uneven. *Tenacity:* Brittle. *Hardness* = ~ 3.5 VHN = 172 (20 g load). *D(meas.)* = n.d. *D(calc.)* = 4.86

Optical Properties: Opaque. *Color:* Black; gray with weak bluish tint in reflected light.

Streak: Reddish black. *Luster:* Metallic to adamantine.

Optical Class: n.d.

R: (400) 15.8, (420) 16.2, (440) 16.3, (460) 16.2, (480) 16.0, (500) 15.8, (520) 15.5, (540) 15.3, (560) 15.2, (580) 14.9, (600) 14.7, (620) 14.5, (640) 14.4, (660) 14.2, (680) 14.0, (700) 13.8

Cell Data: *Space Group:* $P\bar{1}$. *a* = 6.4344(11) *b* = 8.3232(13) *c* = 9.1726(16) α = 105.338(14) $^\circ$
 β = 96.113(14) $^\circ$ γ = 107.642(1) $^\circ$ *Z* = 1

X-ray Powder Pattern: Yadovitaya fumarole, Tolbachik volcano, Kamchatka, Russia.

8.65 (100), 6.84 (83), 6.01 (75), 4.198 (67), 4.055 (65), 5.52 (60), 2.896 (60)

Chemistry:	(1)	(2)
CuO	61.82	63.10
ZnO	0.53	
Fe ₂ O ₃	0.04	
V ₂ O ₅	31.07	32.06
As ₂ O ₅	0.32	
MoO ₃	1.56	
Cl	6.23	6.25
<u>-O = Cl₂</u>	<u>1.41</u>	<u>1.41</u>
Total	100.16	100.00

(1) Yadovitaya fumarole, Tolbachik volcano, Kamchatka, Russia; average of 5 electron microprobe analyses; corresponding to (Cu_{8.80}Zn_{0.07}Fe_{0.01}) $\Sigma=8.88$ (V_{3.87}Mo_{0.12}As_{0.03}) $\Sigma=4.02$ O_{18.01}Cl_{1.99}.

(2) Cu₉O₂(VO₄)₄Cl₂.

Occurrence: In sublimates around a volcanic fumarole.

Association: Euchlorine, fedotovite, hematite, tenorite, Cu-rich lyonsite, melanothallite, atlasovite, kamchatkite, avdoninite, belloite, chalcantinite.

Distribution: At Yadovitaya fumarole, Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka, Russia.

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Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4240/1).

References: (1) Pekov, I.V., N.V. Zubkova, M.E. Zelenski, V.O. Yapaskurt, Yu.S. Polekhovskiy, O.A. Fadeeva, and D.Yu. Pushcharovskiy (2013) Yaroshevskite, Cu₉O₂(VO₄)₄Cl₂, a new mineral from the Tolbachik volcano, Kamchatka, Russia. *Mineral. Mag.*, 77(1), 107-116. (2) (2016) *Amer. Mineral.*, 101, 237 (abs. ref. 1).