Dokuchaevite $Cu_8O_2(VO_4)_3Cl_3$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As bladed to prismatic crystals to 150 μm.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Uneven. Hardness = ~2 VHN = 54-56, 55 average (20 g load). D(meas.) = n.d. D(calc.) = 4.142 Nonfluorescent. Soluble in warm H_2O.

Optical Properties: Transparent. *Color*: Dark red; gray with a yellowish tint and abundant yellow-red internal reflections in reflected light. *Streak*: Reddish black. *Luster*: Almost adamantine. *Optical Class*: Non-pleochroic. Weak bireflectance.
R_1-R_2: (470) 12.36-13.30, (546) 12.96-13.81, (589) 13.02-13.87, (650) 12.84-13.75

Cell Data: *Space Group: P*$\bar{1}$. a = 6.332(3) b = 8.204(4) c = 15.562(8) α = 90.498(8)° β = 97.173(7)° γ = 90.896(13)° Z = 2

X-Ray Diffraction Pattern: Yadovitaya fumarole, Tolbachik volcano, Far-Eastern Region, Russia. 2.522 (100), 5.596 (43), 4.857 (33), 2.791 (30), 3.193 (29), 7.276 (27), 2.564 (21)

Chemistry:

	(1)	(2)
CuO	60.87	64.18
ZnO	0.50	
FeO	0.36	
V_2O_5	19.85	27.52
As_2O_5	6.96	
SO_3	0.44	
MoO_3	1.41	
SiO_2	0.20	
P_2O_5	0.22	
Cl	10.66	10.73
$-O = Cl_2$	2.41	2.42
Total	99.06	100.00

(1) Yadovitaya fumarole, Tolbachik volcano, Far-Eastern Region, Russia; average electron microprobe analysis; corresponds to $(Cu_{7.72}Zn_{0.06}Fe_{0.05})_{\Sigma=7.83}(V_{2.20}As_{0.61}Mo_{0.10}S_{0.06}P_{0.03}Si_{0.03})_{\Sigma=3.03}O_{13.96}Cl_{3.04}$. (2) $Cu_8O_2(VO_4)_3Cl_3$.

Occurrence: A sublimate at an active volcanic fumarole.

Association: Kamchatkite, euchlorine, langbeinite, alumoklyuchevskite, lyonsite, pseudolyonsite, tenorite, hematite, anhydrite.

Distribution: At the Yadovitaya ('Poisonous') fumarole, Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka peninsula, Far-Eastern Region, Russia.

Name: Honors Russian Professor Vasily V. *Dokuchaev* (1846-1903), a founder of Soil Science who lectured on mineralogy and crystallography at St. Petersburg State University.

Type Material: Mineralogical Museum, Department of Mineralogy, St. Petersburg State University, St. Petersburg, Russia (1/19664).

References: (1) Siidra, O.I., E.V. Nazarchuk, A.N. Zaitsev, Y.S. Polekhovsky, T. Wenzel, and J. Spratt (2019) Dokuchaevite, $Cu_8O_2(VO_4)_3Cl_3$, a new mineral with remarkably diverse Cu^{2+} mixed-ligand coordination environments. Mineral. Mag., 83, 749-755.