Edtollite $K_2NaCu_5Fe^{3+}O_2(AsO_4)_4$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As prismatic crystals to 0.1 mm.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Uneven. Hardness = n.d. D(meas.) = n.d. D(calc.) = 4.264

Optical Properties: Translucent to almost opaque. *Color*: Brown-black to black, gray in reflected light with weak, brown internal reflections. *Streak*: Light brown. *Luster*: Semi-metallic. *Optical Class*: *Anisotropy*: Distinct. *Bireflectance*: Very weak. R_1-R_2: (470) 8.3-8.2, (546) 7.7-7.4, (589) 7.1-6.9, (650) 6.3-6.3

Cell Data: *Space Group*: $P\bar{1}$. a = 5.1168(6) b = 9.1241(12) c = 9.6979(14) α = 110.117(13)° β = 102.454(12)° γ = 92.852(11)° Z = 1

X-Ray Diffraction Pattern: Arsenatnaya fumarole, Tolbachik Volcano, Russia. 3.427 (100), 8.79 (92), 2.851 (65), 3.148 (64), 5.22 (44), 7.63 (41), 2.551 (40)

Chemistry:

	(1)	(2)
Na_2O	3.13	2.92
K_2O	8.12	8.87
CuO	36.55	37.43
ZnO	0.46	
Fe_2O_3	7.34	7.52
TiO_2	0.27	
As_2O_5	43.57	43.26
Total	99.44	100.00

(1) Arsenatnaya fumarole, Tolbachik Volcano, Kamchatka, Russia; average electron microprobe analysis supplemented by Raman spectroscopy; corresponds to $K_{1.83}Na_{1.07}Cu_{4.88}Zn_{0.06}Fe^{3+}_{0.98}Ti_{0.04}As_{4.03}O_{18}$. (2) $K_2NaCu_5Fe^{3+}O_2(AsO_4)_4$.

Occurrence: A sublimate on basaltic scoria at an active volcanic fumarole.

Association: Hematite, dmisokolovite, johillerite, bradaczekite, orthoclase, sylvite.

Distribution: From the Arsenatnaya fumarole, Second scoria cone, Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik Volcano, Kamchatka, Russia.

Name: Honors Russian geologist and Arctic explorer *Ed*uard Vasilievich *Toll* (1858-1902) for contributions to the geology and geography of Polar Siberia and islands in the Arctic Ocean.

Type Material: A.E. Fersman Mineralogical Museum, RAS, Moscow, Russia (95350).

References: (1) Pekov, I.V., N.V. Zubkova, A.A. Agakhanov, D.A. Ksenofontov, L.A. Pautov, E.G. Sidorov, S.N. Britvin, M.F. Vigasina, and D.Y. Pushcharovsky (2019) New arsenate minerals from the Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia. X. Edtollite, $K_2NaCu_5Fe^{3+}O_2(AsO_4)_4$, and alumoedtollite, $K_2NaCu_5AlO_2(AsO_4)_4$. Mineral. Mag., 83, 485-495.