Arsmirandite $Na_{18}Cu_{12}Fe^{3+}O_8(AsO_4)_8Cl_5$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As equant, thick tabular or short prismatic crystals with pyramid-like terminations to 30 μm in crusts. *Twinning*: Cyclic interpenetrant, common.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Uneven.
Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.715

Optical Properties: Translucent to nearly opaque. *Color*: Dark grayish green to olive-greenish black, dark gray in reflected light. *Streak*: Grayish green with olive hue. *Luster*: Strong vitreous. *Optical Class*: *Bireflectance*: Weak. *Anisotropism*: Weak. *Pleochroism*: None.
R_1-R_2: (470) 7.3-7.6, (546) 6.9-7.2, (589) 6.8-7.1, (650) 6.7-7.0

Cell Data: *Space Group*: *C*2/*m*. a = 10.742(2) b = 21.019(3) c = 11.787(2) β = 117.06(3)° Z = 2

X-ray Powder Pattern: Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia.
8.74 (100), 5.288 (80), 10.58 (79), 2.574 (74), 5.381 (46), 3.770 (33), 2.643 (30)

Chemistry:

	(1)		(1)
Na_2O	20.04	Fe_2O_3	2.79
K_2O	0.91	TiO_2	0.29
CaO	0.12	SiO_2	0.05
PbO	0.67	P_2O_5	0.07
MgO	0.17	V_2O_5	0.04
MnO	0.03	As_2O_5	34.46
CuO	35.37	SO_3	0.25
ZnO	0.25	Cl	6.41
Al_2O_3	0.03	-O = Cl	1.45
		Total	100.50

(1) Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia; average electron microprobe analysis supplemented by IR spectroscopy; corresponds to $(Na_{17.06}K_{0.51}Pb_{0.08}Ca_{0.06})_{\Sigma=17.71}(Cu_{11.73}Mg_{0.11}Zn_{0.08}Mn_{0.01})_{\Sigma=12.93}(Fe^{3+}_{0.92}Ti_{0.10}Al_{0.02})_{\Sigma=1.04}(As_{7.91}S_{0.08}P_{0.03}Si_{0.02}V_{0.01})_{\Sigma=8.05}O_{40.23}Cl_{4.77}$.

Occurrence: A sublimate around an active volcanic fumarole.

Association: Lehmannite, hematite, sanidine, sylvite, halite, tenorite, cassiterite, rutile, and 40 other species.

Distribution: From the Arsenatnaya fumarole, Second scoria cone, Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka, Russia.

Name: The prefix, *ars*, identifies essential arsenic and *mirand*us (Latin for 'marvellous') in allusion to the unusual crystal structure.

Type Material: A.E. Fersman Mineralogical Museum, RAS, Moscow, Russia (94623).

References: (1) Pekov, I.V., S.N. Britvin, V.O. Yapaskurt, N.N. Koshlyakova, Y.S. Polekhovsky, J. Göttlicher, N.V. Chukanov, M.F. Vigasina, S.V. Krivovichev, A.G. Turchkova, and E.G. Siderov (2020) Arsmirandite, $Na_{18}Cu_{12}Fe^{3+}O_8(AsO_4)_8Cl_5$, and lehmannite, $Na_{18}Cu_{12}TiO_8(AsO_4)_8FCl_5$, new minerals from fumerole exhalations of the Tolbachik Volcano, Kamchatka, Russia. Zap. Ross. Mineral. Obshch., 149(3), 1-17.