

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

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = ~4.5 VHN = 339-537, 416 average (100 g load). D(meas.) = n.d. D(calc.) = 3.676

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:* Birefractance: Weak with brown internal reflections. *Anisotropism:* Weak. *Pleochroism:* None. R₁-R₂: (470) 8.1-8.7, (546) 7.9-8.5, (589) 7.6-8.4, (650) 7.6-8.3

Cell Data: *Space Group:* C2/m. *a* = 10.8236(15) *b* = 21.1077(17) *c* = 11.8561(11) β = 117.195(8)° *Z* = 2

X-ray Powder Pattern: Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia. 8.74 (100), 2.573 (98), 5.273 (74), 10.52 (65), 2.636 (43), 3.772 (37), 1.889 (33)

Chemistry:	(1)		(1)
Na ₂ O	20.62	SiO ₂	0.06
K ₂ O	0.31	P ₂ O ₅	0.23
CaO	0.51	As ₂ O ₅	33.04
CuO	34.25	SO ₃	0.43
Fe ₂ O ₃	0.63	Cl	7.13
TiO ₂	2.53	F	0.53
SnO ₂	0.62	<u>-O = Cl + F</u>	<u>1.85</u>
		Total	99.05

(1) Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia; average electron microprobe analysis supplemented by IR spectroscopy; corresponds to (Na_{17.92}K_{0.18}Ca_{0.24})_{Σ=18.34}(Cu_{11.59}Fe³⁺_{0.92})_{Σ=11.80}(Ti_{0.85}Sn_{0.11})_{Σ=0.96}(As_{7.74}S_{0.14}P_{0.09}Si_{0.03})_{Σ=8.00}O_{40.10}F_{0.75}Cl_{5.42}.

Occurrence: A sublimate around an active volcanic fumarole.

Association: Arsmirandite, 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: Honors Johann Gottlob *Lehmann* (1719-1767) Academician of the Royal Prussian Academy of Sciences (1754) and the Imperial Russian Academy of Sciences (1761); author of the first mineral description of a new species discovered in Russia - crocoite.

Type Material: A.E. Fersman Mineralogical Museum, RAS, Moscow, Russia (96255).

References: (1) Pekov, I.V., S.N. Britvin, V.O. Yapaskurt, N.N. Koshlyakova, Y.S. Polekhovskiy, J. Göttlicher, N.V. Chukanov, M.F. Viggasina, S.V. Krivovichev, A.G. Turchkova, and E.G. Siderov (2020) Arsmirandite, Na₁₈Cu₁₂Fe³⁺O₈(AsO₄)₈Cl₅, and lehmannite, Na₁₈Cu₁₂TiO₈(AsO₄)₈FCl₅, new minerals from fumarole exhalations of the Tolbachik Volcano, Kamchatka, Russia. Zap. Ross. Mineral. Obshch., 149(3), 1-17.