

Crystal Data: Tetragonal. *Point Group:* $4/m\ 2/m\ 2/m$. As prismatic, equant or tabular crystals to 0.1 mm displaying {100}, {110}, and {001}.

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* n.d.
Hardness = ~ 3 D(meas.) = 2.61(1) D(calc.) = 2.72-2.79 [dependent on Pb content].
Dissolves in water.

Optical Properties: Transparent. *Color:* Yellow-brown to dark brown. *Streak:* Yellow.
Luster: Vitreous.
Optical Class: Uniaxial (-). $\omega = 1.727(3)$ $\varepsilon = 1.694(2)$

Cell Data: *Space Group:* $I4/mmm$. $a = 17.5538(19)$ $c = 15.8620(17)$ $Z = 4$

X-ray Powder Pattern: Tolbachik volcano, Kamchatka, Russia.
8.80 (100), 2.933 (80), 12.48 (56), 6.71 (40), 2.607 (38), 11.74 (36), 7.97 (34)

Chemistry:	(1)
K	21.52
Pb	0.89
Cu	28.79
Zn	0.02
Cl	44.74
O	[4.85]
H	[0.41]
Total	101.22

(1) Tolbachik volcano, Kamchatka, Russia; average of 9 electron microprobe analyses supplemented by Raman spectroscopy, H and O from structure analysis; corresponding to $K_{10.90}Pb_{0.09}Cu_{8.97}Zn_{0.01}Cl_{25}(OH)_4 \cdot 2H_2O$.

Occurrence: As sublimates around active fumaroles.

Association: Arsenatnaya fumarole: avdoninite, hematite, pseudobrookite, clinoenstatite, diopside, anhydrite, powellite, barite; Glavnaya Tenoritovaya fumarole: avdoninite, belloite, sylvite, carnallite, mitscherlichite, sanguite, chlorothionite, eriochalcite, chrysothallite, mellizinkalite.

Distribution: From the Glavnaya Tenoritovaya and Arsenatnaya fumaroles, Second scoria cone, 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 (4544/1).

References: (1) Pekov, I.V., V.O. Yapaskurt, S.N. Britvin, M.F. Viggasina, I.S. Lykova, N.V. Zubkova, S.V. Krivovichev, and E.G. Sidorov (2016) Romanorlovite, a new copper and potassium hydroxychloride from the Tolbachik volcano, Kamchatka, Russia. *Zapiski Rossiyskogo Mineralogicheskogo Obshchestva*, 145(2), 44-58. (2) Zubkova, N.V., S.V. Krivovichev, I.V. Pekov, A.A. Zolotarev Jr., D.Yu. Pushcharovsky, and E.G. Sidorov (2016) Crystal structure and comparative crystal chemistry of romanorlovite. *Zapiski Rossiyskogo Mineralogicheskogo Obshchestva*, 145(4), 36-46. (3) (2017) *Amer. Mineral.*, 102, 1569 (abs. refs. 1 & 2).