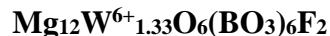


Rhabdoborite-(W)

Crystal Data: Hexagonal. *Point Group:* 6. As prismatic to acicular crystals to 7 mm typically in parallel or radial intergrowths, bunches, sheaf- or broom-like clusters to 1 cm.

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.59

Optical Properties: Transparent. *Color:* Light yellow, beige. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Uniaxial (+). $\omega = 1.720(5)$ $\epsilon = 1.750(5)$ *Pleochroism:* Distinct, *E* = yellow with slight greenish tint, *O* = very pale yellow to colorless.

Cell Data: *Space Group:* $P6_3$. $a = 10.6366(5)$ $c = 4.5701(3)$ $Z = 1$

X-Ray Diffraction Pattern: Arsenatnaya fumarole, Tolbachik volcano, Kamchatka Peninsula, Russia. 9.18 (100), 3.479 (61), 5.304 (38), 2.228 (35), 2.550 (30), 4.595 (25), 1.703 (25)

Chemistry:	(1)
MgO	48.89
CaO	0.15
MnO	0.15
Fe ₂ O ₃	0.78
B ₂ O ₃	20.33
P ₂ O ₅	1.80
As ₂ O ₅	1.60
V ₂ O ₅	4.10
MoO ₃	2.48
WO ₃	18.04
F	3.10
-O = F ₂	1.31
Total	100.11

(1) Arsenatnaya fumarole, Tolbachik volcano, Kamchatka Peninsula, Russia; average electron microprobe analysis supplemented by Raman spectroscopy; corresponding to $(\text{Mg}_{11.74}\text{Fe}^{3+}_{0.09}\text{Ca}_{0.03}\text{Mn}_{0.02})_{\Sigma=11.88}(\text{W}^{6+}_{0.75}\text{V}^{5+}_{0.44}\text{Mo}^{6+}_{0.13})_{\Sigma=1.32}[(\text{P}_{0.25}\text{As}^{5+}_{0.13})_{\Sigma=0.38}\text{B}_{5.65}]_{\Sigma=6.03}\text{O}_{24.42}\text{F}_{1.58}$.

Polymorphism & Series; Continuous solid solution with rhabdoborite-(V) and rhabdoborite-(Mo).

Mineral Group: Rhabdoborite group.

Occurrence: A volcanic sublimate or, more probably, formed by the interaction between fumarolic gas and basalt scoria.

Association: Rhabdoborite-(V), rhabdoborite-(Mo), anhydrite, diopside, hematite, schäferite, berzeliite, svabite, calciojohillerite, ludwigite, forsterite, magnesioferrite, baryte, fluorapatite, udinaite, arsenudinaite, powellite.

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

Name: Refers to morphological (*rhabdos* is “rod”, in Greek) and chemical (*borate*) features of the mineral; a suffix indicates the dominant element as the *M* component.

Type Material: A.E. Fersman Mineralogical Museum, RAS, Moscow, Russia (96198).

References: (1) Pekov, I.V., N.V. Zubkova, N.N. Koshlyakova, D.I. Belakovskiy, A.A. Agakhanov, M.F. Vlgasina, S.N. Britvin, E.G. Sidorov, and D.Y. Pushcharovsky (2020) Rhabdoborite-(V), rhabdoborite-(Mo) and rhabdoborite-(W): a new group of borate minerals with the general formula $\text{Mg}_{12}\text{M}_{1/3}\text{O}_6[(\text{BO}_3)_{6-x}(\text{PO}_4)_x\text{F}_{2-x}]$ ($\text{M}=\text{V}^{5+}$, Mo^{6+} or W^{6+} and $x < 1$). *Phys. Chem. Minerals*, 47, 44, 1-17.