Markhininite $TlBi(SO_4)_2$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As pseudohexagonal platy crystals, < 0.1 mm.

Physical Properties: *Cleavage*: Perfect on {011}. *Fracture*: Conchoidal. *Tenacity*: Brittle. Hardness = n.d. D(meas.) = n.d. D(calc.) = 5.91

Optical Properties: Transparent. *Color*: White. *Streak*: White. *Luster*: Adamantine. *Optical Class*: n.d.

Cell Data: *Space Group*: $P\bar{1}$. a = 7.378(3) b = 10.657(3) c = 10.657(3) α = 61.31(3)° β = 70.964(7)° γ = 70.964(7)° Z = 4

X-ray Powder Pattern: Great Fissure Tolbachik volcano, Kamchatka Peninsula, Russia. 3.441 (100), 4.264 (68), 2.717 (45), 3.350 (35), 2.114 (34), 3.125 (24), 3.054 (23)

Chemistry:	(1)	(2)
Tl_2O	35.41	35.08
Bi_2O_3	38.91	38.48
SO_3	25.19	26.44
Total	99.51	100.00

(1) Great Fissure Tolbachik volcano, Kamchatka Peninsula, Russia; average of 20 electron microprobe analyses; corresponding to $Tl_{1.04}Bi_{1.05}S_{1.97}O_8$. (2) $TlBi(SO_4)_2$.

Occurrence: Product of fumarolic activity around a volcanic vent.

Association: Shcherbinaite, pauflerite, bobjonesite, karpovite, evdokimovite.

Distribution: At the first scoria cone, North Breach of the Great Fissure Tolbachik volcano, Kamchatka Peninsula, Russia.

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Type Material: Mineralogical Museum of St. Petersburg State University, St. Petersburg, Russia (1/19526).

References: (1) Siidra, O.I., L.P. Vergasova, S.V. Krivovichev, Y.L. Kretser, A.N. Zaitsev, and S.K. Filatov (2014) Unique thallium mineralization in the fumaroles of Tolbachik volcano, Kamchatka Peninsula, Russia. I. Markhininite, $TlBi(SO_4)_2$. Mineral. Mag., 78(7), 1687-1698. (2) (2015) Amer. Mineral., 100, 1652 (abs. ref. 1).