Bubnovaite $K_2Na_8Ca(SO_4)_6$

Crystal Data: Hexagonal. *Point Group*: 3*m*. As dendritic aggregates of needle-like or tabular hexagonal crystals, to 0.14 mm.

Physical Properties: *Cleavage*: n.d. *Fracture*: n.d. *Tenacity*: Brittle. Hardness = ~ 2-3
D(meas.) = n.d. D(calc.) = 2.656

Optical Properties: Transparent. *Color*: Colorless, turns white on exposure to air.
Streak: White. *Luster*: Vitreous.
Optical Class: Uniaxial (–). ω = 1.492(2) ε = 1.489(2)

Cell Data: *Space Group*: *P*31*c*. *a* = 10.804(3) *c* = 22.011(6) Z = 4

X-ray Powder Pattern: Naboko cone, Tolbachik volcano, Kamchatka Peninsula, Russia.
2.707 (100), 2.718 (91), 3.943 (80), 2.868 (62), 2.894 (35), 1.970 (21), 2.647(10)

Chemistry:	(1)	(2)
Na_2O	26.99	28.22
K_2O	10.99	10.72
CaO	4.27	6.38
MgO	0.51	
CuO	1.21	
ZnO	0.81	
PbO	1.58	
SO_3	54.93	54.68
Total	101.30	100.00

(1) Naboko cone, Tolbachik volcano, Kamchatka Peninsula, Russia; average of 7 electron microprobe analyses; corresponds to $K_{2.05}Na_{7.65}(Ca_{0.67}Mg_{0.11}Cu_{0.13}Zn_{0.09}Pb_{0.06})_{\Sigma=1.06}S_{6.03}O_{24}$.
(2) $K_2Na_8Ca(SO_4)_6$.

Occurrence: As sublimate incrustations and/or products of reaction between rock and volcanic gas on the surface of basalt scoria in an active fumarole.

Association: Aphthitalite, thénardite.

Distribution: At the Naboko cone, Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka Peninsula, Russia.

Name: Honors Russian scientist, Professor Rimma Sergeevna Bubnova (b. 1951), Institute of Silicate Chemistry, Russian Academy of Sciences, St-Petersburg State University, Russia, for her contributions to the crystal chemistry of vanadates, silicates, borates, borosilicates and other inorganic oxysalts.

Type Material: Mineralogical Museum, St. Petersburg State University, St. Petersburg, Russia, (1/19635).

References: (1) Gorelova, L.A., L.P. Vergasova, S.V. Krivovichev, E.Yu. Avdontseva, S.V. Moskaleva, G.A. Karpov, and S.K. Filatov (2016) Bubnovaite, $K_2Na_8Ca(SO_4)_6$, a new mineral species with modular structure from the Tolbachik volcano, Kamchatka peninsula, Russia. Eur. J. Mineral., 28(3), 677-686. (2) (2016) Amer. Mineral., 101, 2778 (abs. ref. 1).