Metathénardite $Na_2(SO_4)$

Crystal Data: Hexagonal. *Point Group*: 6/*m* 2/*m* 2/*m*. Hexagonal tabular, lamellar, or dipyramidal crystals to 3 mm display {001}, {100}, {102}, and {201}, in crusts.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Uneven. Hardness = ~3
D(meas.) = 2.72(1) D(calc.) = 2.732

Optical Properties: Transparent to semitransparent. *Color*: Colorless, white, light blue, greenish, yellowish, grayish, or brownish. *Streak*: White. *Luster*: Vitreous.
Optical Class: Uniaxial (-). ω = 1.489(2) ε = 1.486(2) Nonpleochroic.

Cell Data: *Space Group*: $P6_3/mmc$. a = 5.3467(9) c = 7.0876(16) Z = 2

X-Ray Diffraction Pattern: Glavnaya Tenoritovaya fumarole, Tolbachik Volcano, Russia.
2.686 (100), 2.824 (94), 3.904 (89), 1.939 (35), 3.565 (33), 4.667 (27), 2.325 (12)

Chemistry:

	(1)	(2)
Na_2O	41.20	43.64
K_2O	1.57	
CaO	0.82	
ZnO	0.66	
SO_3	55.01	56.36
Total	99.26	100.00

(1) Glavnaya Tenoritovaya fumarole, Tolbachik Volcano, Kamchatka, Russia; average electron microprobe analysis supplemented by IR and Raman spectroscopy; corresponding to $(Na_{1.92}K_{0.05}Ca_{0.02}Zn_{0.01})(S_{0.99}O_4)$. (2) Na_2SO_4.

Polymorphs & Series: The high-temperature hexagonal dimorph of thenardite.

Occurrence: A sublimate at active volcanic fumaroles.

Association: Hematite, tenorite, fluorophlogopite, sanidine, anhydrite, krasheninnikovite, vanthoffite, glauberite, johillerite, lammerite (Glavnaya Tenoritovaya); hematite, tenorite, fluorophlogopite, sanidine, euchlorine, wulffite, anhydrite, fluoborite, johillerite, nickenichite, calciojohillerite, badalovite, tilasite, cassiterite, pseudobrookite (Arsenarnaya); tenorite, euchlorine, fedotovite, dolerophanite, langbeinite, krasheninnikovite, anhydrite, hematite (Yadovitaya).

Distribution: From the Glavnaya Tenoritovaya, Arsenarnaya, and Yadovitaya fumaroles, Second scoria cone, Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik Volcano, Kamchatka, Russia.

Name: The prefix, *meta*, indicates a dimorphous relationship with *thénardite*.

Type Material: A.E. Fersman Mineralogical Museum, RAS, Moscow, Russia (95281 and 95590).

References: (1) Pekov, I.V., N.V. Shchipalkina, N.V. Zubkova, V.V. Gurzhiy, A.A. Agakhanov, D.I. Belakovskiy, N.V. Chukanov, I.S. Lykova, M.F. Vigasina, N.N. Koshlyakova, E.G. Sidorov, and G. Giester (2019) Alkali sulfates with aphthitalite-like structures from fumaroles of the Tolbachik volcano, Kamchatka, Russia. I. Metathénardite, a natural high-temperature modification of Na_2SO_4. Can. Mineral., 57(6), 885-901.