Krasheninnikovite $KNa_2CaMg(SO_4)_3F$

Crystal Data: Hexagonal. *Point Group*: 6/*m* 2/*m* 2/*m*. As acicular to terminated prismatic crystals elongated along [0001], to 3 mm; also in sheaf-like, radiating or open-work matted aggregates forming nests to several cm^3 or in "fluffy" crusts.

Physical Properties: *Cleavage:* None. *Tenacity*: Brittle; needles flexible and elastic. *Fracture*: Uneven. Hardness = 2.5-3 D(meas.) = 2.68(1) D(calc.) = 2.67 Dissolves in water.

Optical Properties: Transparent. *Color*: Colorless; white aggregates; colorless in transmitted light. *Streak*: White. *Luster*: Vitreous.
Optical Class: Uniaxial (–). ω = 1.500(2) ε = 1.492(2)

Cell Data: *Space Group: P*6_3/*mcm*. a = 16.6682(2) c = 6.9007(1) Z = 6

X-ray Powder Pattern: Second scoria cone, Tolbachik volcano, Kamchatka, Russia.
3.153 (100), 3.454 (43), 3.467 (42), 2.660 (39), 3.613 (24), 4.286 (22), 3.116 (22)

Chemistry:	(1)	(2)
Na_2O	15.48	13.57
K_2O	6.92	10.31
CaO	11.51	12.28
MgO	9.25	8.83
MnO	0.15	
FeO	0.04	
Al_2O_3	0.23	
SO_3	53.51	52.60
F	3.22	4.16
Cl	0.16	
$– O = (F,Cl)_2$	1.39	1.75
Total	99.08	100.00

(1) Second scoria cone, Tolbachik volcano, Kamchatka, Russia; average of 5 electron microprobe analyses supplemented by FTIR spectroscopy; corresponds to $K_{0.67}Na_{2.27}Ca_{0.93}Mn_{0.01}Mg_{1.04}Al_{0.02}(SO_4)_{3.04}F_{0.76}Cl_{0.02}O_{0.06}$. (2) $KNa_2CaMg(SO_4)_3F$.

Occurrence: A sublimate around an active volcanic fumarole.

Association: Tenorite, thenardite, hematite, euchlorine, blödite, vergasovaite, fluorophlogopite.

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

Name: Honors the Russian geographer, ethnographer, and naturalist Stephan Petrovich Krasheninnikov (1711-1755), one of the first scientists who researched and published on Kamchatka.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4112/1).

References: (1) Pekov, I.V., M.E. Zelenski, N.V. Zubkova, D.A. Ksenofontov, Y.K. Kabalov, N.V. Chukanov, V.O. Yapaskurt, A.E. Zadov, and D.Y. Pushcharovsky (2012) Krasheninnikovite, $KNa_2CaMg(SO_4)_3F$, a new mineral from the Tolbachik volcano, Kamchatka, Russia. Amer. Mineral., 97, 1788-1795.