

Crystal Data: Isometric. *Point Group:* 23. As distorted, flattened, curved or skeletal crystals and almost anhedral grains, to 1 mm. Crystals are tetrahedral or pseudo-octahedral when the faces of the positive and negative tetrahedra are equally developed; also in complex epitaxial intergrowths with langbeinite.

Physical Properties: *Cleavage:* None. *Fracture:* Conchoidal. *Tenacity:* Brittle.
Hardness = 3-3.5 D(meas.) = 2.68(2) D(calc.) = 2.74

Optical Properties: Transparent. *Color:* Colorless. *Streak:* White. *Luster:* Vitreous.
Optical Class: Isotropic. $n = 1.527(2)$

Cell Data: *Space Group:* $P2_13$. $a = 10.1887(4)$ $Z = 4$

X-ray Powder Pattern: Yadovitaya fumarole, Tolbachik volcano, Kamchatka, Russia.
3.218 (100), 2.736 (37), 4.15 (27), 2.006 (11), 4.54 (9), 5.84 (8), 2.838 (8)

Chemistry:	(1)	(2)
Na ₂ O	0.38	
K ₂ O	21.85	21.10
MgO	6.52	
CaO	16.00	25.11
MnO	0.27	
FeO	0.08	
Al ₂ O ₃	0.09	
SO ₃	55.14	53.79
Total	100.63	100.00

(1) Yadovitaya fumarole, Tolbachik volcano, Kamchatka, Russia; average of 5 electron microprobe analyses, SO₄²⁻ confirmed by IR spectroscopy; corresponding to K_{2.01}(Ca_{1.24}Mg_{0.70}Na_{0.05}Mn_{0.02}Fe_{0.01}Al_{0.01})_{Σ=2.03}S_{3.00}O₁₂. (2) K₂Ca₂(SO₄)₃.

Polymorphism & Series: Forms a series with langbeinite.

Occurrence: In sublimate crusts around a volcanic fumarole on an active scoria cone.

Association: Langbeinite, piypite, hematite, Fe- and Sb-bearing rutile, pseudobrookite, As- and Zn-bearing orthoclase in solid solution with filatovite, lyonsite, lammerite, and late secondary cyanochroite and chlorothionite.

Distribution: From the Yadovitaya [Poisonous] fumarole on the Second scoria cone, Northern Breakthrough of the Great Tolbachik Fissure eruption, Tolbachik volcano, Kamchatka, Russia.

Name: As the Ca-dominant analog of *langbeinite*.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (#4153/1).

References: (1) Pekov, I.V., M.E. Zelenski, N.V. Zubkova, V.O. Yapaskurt, N.V. Chukanov, D.I. Belakovskiy, and D.Yu. Pushcharovsky (2012) Calciolangbeinite, K₂Ca₂(SO₄)₃, a new mineral from the Tolbachik volcano, Kamchatka, Russia. *Mineral. Mag.*, 76(3), 673-682. (2) (2015) *Amer. Mineral.*, 100, 1320 (abs. ref. 1).