

**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 <sub>2</sub> O	0.38	
K <sub>2</sub> O	21.85	21.10
MgO	6.52	
CaO	16.00	25.11
MnO	0.27	
FeO	0.08	
Al <sub>2</sub> O <sub>3</sub>	0.09	
SO <sub>3</sub>	55.14	53.79
Total	100.63	100.00

(1) Yadovitaya fumarole, Tolbachik volcano, Kamchatka, Russia; average of 5 electron microprobe analyses, SO<sub>4</sub><sup>2-</sup> confirmed by IR spectroscopy; corresponding to K<sub>2.01</sub>(Ca<sub>1.24</sub>Mg<sub>0.70</sub>Na<sub>0.05</sub>Mn<sub>0.02</sub>Fe<sub>0.01</sub>Al<sub>0.01</sub>)<sub>Σ=2.03</sub>S<sub>3.00</sub>O<sub>12</sub>. (2) K<sub>2</sub>Ca<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>.

**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, K<sub>2</sub>Ca<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, a new mineral from the Tolbachik volcano, Kamchatka, Russia. *Mineral. Mag.*, 76(3), 673-682. (2) (2015) *Amer. Mineral.*, 100, 1320 (abs. ref. 1).