

Crystal Data: Monoclinic. *Point Group:* $2/m$. As slightly flattened grains.

Physical Properties: *Cleavage:* None observed. *Fracture:* n.d. *Tenacity:* Brittle.
Hardness = 3-4 D(meas.) = n.d. D(calc.) = 4.70

Optical Properties: Transparent. *Color:* Green. *Streak:* n.d.
Luster: Strongly vitreous. *Pleochroism:* $X = Y =$ grass green; $Z =$ yellowish green.
Optical Class: Biaxial (+). $\alpha = 2.05(1)$ $\beta = 2.05(1)$ $\gamma = 2.08(1)$ $2V(\text{meas.}) \approx 0^\circ$
 $2V(\text{calc.}) = 0(5)^\circ$ *Orientation:* $X = a$.

Cell Data: *Space Group:* $P2_1/c$. $a = 5.3982(5)$ $b = 8.0543(8)$ $c = 11.128(1)$
 $\beta = 99.258(2)^\circ$ $Z = 2$

X-ray Powder Pattern: Tolbachik Eruption, Kamchatka Peninsula, Russia.
3.01 (100), 3.22 (90), 2.61 (80B), 2.270 (70), 2.117 (60), 2.58 (40), 1.953 (40)

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|--------------------------|-------------|
| Chemistry: | (1) |
| CuO | 57.98 |
| PbO | 0.66 |
| SeO ₂ | 33.02 |
| Cl | 11.28 |
| <u>-O=Cl₂</u> | <u>2.55</u> |
| Total | 100.39 |

(1) Tolbachik Eruption, Kamchatka Peninsula, Russia, average of 12 electron microprobe analyses, corresponding to $\text{Cu}_{4.91}\text{Pb}_{0.02}\text{O}_{1.86}(\text{SeO}_3)_2\text{Cl}_{2.14}$.

Polymorphism & Series: Dimorphous with georgbokiite.

Occurrence: On the walls of fumaroles, crystallized at 400 to 625°.

Association: Intergrown intimately with cotunnite, ilinskite, chloromenite, burnsite, allochalcoseelite; with ralstonite, tolbachite, melanothallite, chalcocyanite, euchlorine, Fe oxides, tenorite, gold, sphiite.

Distribution: Second cinder cone, North breach, Great Fissure Tolbachik Eruption, Kamchatka Peninsula, Russia.

Name: As the dimorph of the species, *georgebokiite*, named to honor Georgii Borisovich Bokiĭ, (1909–2000), a corresponding member of the Russian Academy of Sciences and a prominent Russian crystal chemist.

Type Material: n.d.

References: (1) Vergasova, L. P., S. V. Krivovichev, S. K. Filatov, S. N. Britvin, P. C. Burns, and V. V. Anan'ev (2007) Parageorgebokiite, $\beta\text{-Cu}_5\text{O}_2(\text{SeO}_3)_2\text{Cl}_2$, a New Mineral Species from Volcanic Exhalations, Kamchatka Peninsula, Russia, *Geology of Ore Deposits*, 49(7), 518-521.

(2) Krivovichev, S.V., S.K. Filatov, P.C. Burns, L.P. Vergasova (2007) The crystal structure of parageorgebokiite, $\beta\text{-Cu}_5\text{O}_2(\text{SeO}_3)_2\text{Cl}_2$. *Can. Mineral.*, 45, 929–934. (3) (2008) *Amer. Mineral.*, 93, 704 (abs. ref. 2).