Sofiite $Zn_2(Se^{4+}O_3)Cl_2$

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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals are thin platy to micalike, pseudohexagonal, may be elongated along [001], with {010}, {100}, to 5 mm. *Twinning:* On {100}, contact, to give "swallow-tail" forms.

Physical Properties: *Cleavage:* On {010}, perfect; on {201}, less perfect. *Tenacity:* Brittle. Hardness = n.d. VHN = 38–61, average 49 (10 g load). D(meas.) = n.d. D(calc.) = 3.64(1) Soluble with difficulty in H_2O.

Optical Properties: Transparent. *Color:* Colorless, becomes sky-blue on long exposure to air. *Streak:* White. *Luster:* Vitreous to greasy or silky.
Optical Class: Biaxial (+). *Orientation:* $X = b$; $Y = c$; $Z = a$. $\alpha = 1.709(3)$ $\beta = 1.726(2)$ $\gamma = 1.750(2)$ 2V(meas.) = n.d. 2V(calc.) = 91°

Cell Data: *Space Group: Pccn.* $a = 10.251(4)$ $b = 15.223(2)$ $c = 7.666(5)$ $Z = 8$

X-ray Powder Pattern: Tolbachik volcano, Russia; preferred orientation due to {010} cleavage.
7.61 (100), 3.807 (23), 2.918 (12), 3.055 (8), 3.237 (6), 2.538 (6), 2.727 (4)

Chemistry:

	(1)	(2)
SeO_2	34.48	33.76
CuO	0.19	
ZnO	47.83	49.53
PbO	0.35	
Cl	22.26	21.58
$-O = Cl_2$	5.02	4.87
Total	100.09	100.00

(1) Tolbachik volcano, Russia; by electron microprobe, average of 38 analyses; corresponds to $(Zn_{1.92}Cu_{0.01}Pb_{0.01})_{\Sigma=1.94}(Se_{1.02}O_{2.94})Cl_{2.06}$. (2) $Zn_2(SeO_3)Cl_2$.

Occurrence: In fractures in volcanic fumaroles, formed at 180 °C–230 °C.

Association: Tenorite, cotunnite, piypite, ponomarevite, chalcocyanite, chloromenite, burnsite, ilinskite, georgbokiite, dolerophanite, halite, sylvite, gold.

Distribution: From the Tolbachik fissure volcano, Kamchatka Peninsula, Russia.

Name: To honor Sof'ya Ivanovna Naboko (1909–), Institute of Volcanology, Petropavlovsk-Kamchatskii, Russia, leading investigator of the Kamchatka volcanoes.

Type Material: Mining Institute, St. Petersburg, Russia, 1550/1.

References: (1) Vergasova, L.P., S.K. Filatov, T.F. Semenova, and T.M. Filosofva (1989) Sofiite $Zn_2(SeO_3)Cl_2$ – a new mineral from volcanic sublimates. Zap. Vses. Mineral. Obshch., 118(1), 65–69 (in Russian). (2) (1990) Amer. Mineral., 75, 1211–1212 (abs. ref. 1). (3) Semenova, T.F., I.V. Rozhdestvenskaya, S.K. Filatov, and L.P. Vergasova (1992) Crystal structure and physical properties of sophiite [sofiite], $Zn_2(SeO_3)Cl_2$, a new mineral. Mineral. Mag., 56, 241–245.

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