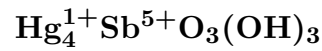


# Shakhovite



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**Crystal Data:** Monoclinic. *Point Group:* *m*. Platy crystals, to about 2 mm, slightly elongated.

**Physical Properties:** *Cleavage:* In two directions, parallel elongation. *Tenacity:* Brittle. Hardness = 3–3.5 VHN = 285–362, 317 average (20 g load). D(meas.) = 8.34–8.51, 8.38 average. D(calc.) = 8.60

**Optical Properties:** Semitransparent. *Color:* Bright lettuce-green, olive-green, yellowish green, darkening on exposure; grayish white in reflected light. *Streak:* Yellowish white.

*Luster:* Adamantine.

*Optical Class:* Biaxial; high birefringence. *Pleochroism:* Weak; olive-green to colorless.

$\alpha = > 2.03$   $\beta = > 2.03$   $\gamma = > 2.03$   $2V(\text{meas.}) = \text{n.d.}$

$R_1$ – $R_2$ : (434) 24.5–19.0, (460) 22.5–17.6, (486) 21.5–16.4, (500) 21.5–16.2, (546) 20.2–15.8, (590) 20.3–15.6, (656) 18.2–13.4

**Cell Data:** *Space Group:* *Im*.  $a = 4.871(1)$   $b = 15.098(3)$   $c = 5.433(1)$   $\beta = 98.86(2)^\circ$   
 $Z = 2$

**X-ray Powder Pattern:** Kelyana mine, Russia.

3.88 (10), 3.33 (8), 2.69 (6), 2.63 (5), 2.552 (5), 1.931 (3.5), 3.47 (3b)

## Chemistry:

	(1)	(2)	(3)	(4)
Hg	77.25	77.57	77.3	78.42
Sb	11.53	11.93	12.1	11.90
O	9.88	9.67		9.38
H				0.30
Total	98.66	99.17		100.00

(1) Kelyana mine, Russia; by electron microprobe, Hg average of 24 analyses, Sb average of 13 analyses, O average of five analyses; Cu, As, Cl, S absent; corresponding to  $\text{Hg}_{4.03}\text{Sb}_{1.00}\text{O}_{6.47}$ .

(2) Khaydarkan, Kyrgyzstan; by electron microprobe, Hg average of 15 analyses, Sb average of 10 analyses, O average of seven analyses; corresponding to  $\text{Hg}_{4.09}\text{Sb}_{1.04}\text{O}_{6.38}$ . (3) Landsberg, Germany; by electron microprobe, presence of  $(\text{OH})^{1-}$  confirmed by IR. (4)  $\text{Hg}_4\text{SbO}_3(\text{OH})_3$ .

**Occurrence:** A late-stage secondary mineral in the oxidation zone of cinnabar-stibnite ore (Kelyana mine, Russia); in the oxidation zone of cinnabar-livingstonite ore (Khaydarkan, Kyrgyzstan); in oxidized Hg–Sb-bearing tetrahedrite ore (Landsberg, Germany).

**Association:** Calomel, eglestonite, mercury, montroydite, terlinguaite, corderoite, kelyanite, kuznetsovite, antimony oxides (Kelyana mine, Russia); calomel, cinnabar, mercury, malachite, goethite (Landsberg, Germany).

**Distribution:** In the Kelyana Sb–Hg mine, North Muya Mountains, Buryatia, Transbaikal, Siberia, Russia. From the Khaydarkan deposit, Fergana Valley, Alai Range, south Kyrgyzstan. At Landsberg, near Obermoschel, and Stahlberg, Rhineland-Palatinate, Germany.

**Name:** To honor Feliks Nikolaevich Shakhov (1894–1971), Head of the Division of Geochemistry of the Russian Academy of Sciences, Novosibirsk, Russia.

**Type Material:** Central Siberian Geological Museum, Siberian Division, Academy of Sciences, Novosibirsk, BII-30/1; Mining Institute, St. Petersburg, 1212/1–2; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 81603.

**References:** (1) Vasil'ev, V.I., Y.G. Lavrent'ev, and N.A. Pal'chik (1980) Shakhovite –  $\text{Hg}_8\text{Sb}_2\text{O}_{13}$  – a new supergene mineral. *Geol. i Geofiz.*, 128–132 (in Russian with English abs.). (2) (1981) *Amer. Mineral.*, 66, 1101 (abs. ref. 1). (3) Tillmanns, E., R. Krupp, and K. Abraham (1982) New data on the mercury antimony mineral shakhovite: chemical composition, unit cell and crystal structure. *Tschemm's Mineral. Petrog. Mitt.*, 30, 227–235. (4) Baur, W.H. and E. Tillmanns (1986) How to avoid unnecessarily low symmetry in crystal structure determinations. *Acta Cryst.*, 42, 95–111.

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