

Crystal Data: Cubic. *Point Group:* $4/m\bar{3}2/m$. [Massive.]

Physical Properties: Hardness = 3.9 VHN = 173 D(meas.) = n.d. D(calc.) = 4.073

Optical Properties: Semitransparent. *Color:* Pale yellow; dark gray in reflected light.

Luster: Vitreous.

Optical Class: Isotropic. $n = 1.735$

Cell Data: *Space Group:* $Pn\bar{3}m$. $a = 7.72(2)$ $Z = 4$

X-ray Powder Pattern: Mushiston deposit, Tajikistan.

3.840 (10), 1.728 (9), 1.570 (8), 2.217 (7), 1.031 (6), 1.117 (5), 1.287 (4)

| Chemistry: | (1) | (2) |
|------------|-------|--------|
| Sn | 41.8 | 41.49 |
| Fe | 0.9 | |
| Cu | 0.3 | |
| Zn | 20.45 | 22.85 |
| OH | 36.0 | 35.66 |
| Total | 99.5 | 100.00 |

(1) Mushiston deposit, Tajikistan; by electron microprobe, average of six analyses; corresponding to $(\text{Zn}_{0.89}\text{Fe}_{0.08}\text{Cu}_{0.01})_{\Sigma=0.98}\text{Sn}_{1.00}(\text{OH})_{6.04}$. (2) $\text{ZnSn}^{4+}(\text{OH})_6$.

Mineral Group: Schoenfliesite group.

Occurrence: Formed by oxidation of earlier tin sulfides in tin deposits.

Association: Stannite, natanite, malachite, azurite, goethite (Mushiston deposit, Tajikistan).

Distribution: In the Trudovoye tin deposit, Inyl'chek Mountains, eastern Kyrgyzstan. From the Mushiston tin deposit, Kaznok Valley, Zeravshan Mountains, 35 km south of Pendzhikent, Tajikistan.

Name: Honors Academician Vladimir Ivanovich Smirnov (1910–1988), Moscow University, Moscow, Russia, an early investigator of tin deposits in Central Asia.

Type Material: Mining Institute, St. Petersburg, 1997/1; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 81651.

References: (1) Marshukova, N.K., A.B. Palovskii, G.A. Sidorenko, and N.I. Chistyakova (1981) Vismirnovite, $\text{ZnSn}(\text{OH})_6$, and natanite, $\text{FeSn}(\text{OH})_6$, new tin minerals. *Zap. Vses. Mineral. Obshch.*, 110, 492–500 (in Russian). (2) (1982) *Amer. Mineral.*, 67, 1077 (abs. ref. 1). (3) (1982) *Mineral. Abs.*, 33, 170 (abs. ref. 1). (4) Cohen-Addad, C. (1967) Étude des hydroxystannates $\text{CaSn}(\text{OH})_6$ et $\text{ZnSn}(\text{OH})_6$ par diffraction des rayons X et résonance magnétique nucléaire. *Bull. Soc. fr. Minéral.*, 90, 32–35 (in French with English abs.).