Toyohaite $Ag_2FeSn_3S_8$

Crystal Data: Monoclinic. *Point Group:* $2/m$, 2, or m. As tiny grains.

Physical Properties: Hardness = n.d. VHN = n.d. D(meas.) = n.d. D(calc.) = 7.25

Optical Properties: Opaque. *Color:* In polished section, white. *Anisotropism:* Distinct to strong; pale gray to steel-bluish black.

R_1–R_2: n.d.

Cell Data: *Space Group:* $B2/m$, $B2$, or Bm. $a = 13.349(10)$ $b = 26.538(20)$ $c = 4.092(7)$ $\beta = 92.77(7)°$ Z = 4

X-ray Powder Pattern: Treasury [*sic*] mine, Colorado, USA.
3.49 (100), 3.22 (80), 1.989 (60), 1.955 (60), 3.63 (50), 2.93 (50), 2.86 (50)

Chemistry:

	(1)	(2)
Ag	12.7	12.26
Pb	19.6	20.18
Bi	50.5	50.90
S	16.4	16.66
Total	99.2	100.00

(1) Treasury (*sic*) mine, Colorado, USA; by electron microprobe, corresponding to $Ag_{1.82}Pb_{1.46}Bi_{3.73}S_{7.89}$. (2) $Ag_7Pb_6Bi_{15}S_{32}$.

Occurrence: In hydrothermal vein material (Treasure Vault mine, Colorado, USA).

Association: A fine-grained decomposition product of treasurite having very similar optical properties (Treasure Vault mine, Colorado, USA).

Distribution: In the USA, from the Treasure Vault (misnamed Treasury) mine, Geneva district, Clear Creek Co., Colorado [TL]; and from a prospect, 10 km southwest of Tyrone, Grant Co., New Mexico. At the Kochbulak gold deposit, Chatkal-Kuramin Mountains, eastern Uzbekistan. In the Beregovo district, near Mukachevo, Ukraine.

Name: For the Treasure Vault lode, Colorado, USA, where it occurs.

Type Material: National Museum of Natural History, Washington, D.C., USA, R9714.

References: (1) Karup-Møller, S. (1977) Mineralogy of some Ag–(Cu)–Pb–Bi sulfide associations. Bull. Geol. Soc. Denmark, 26, 41–68. (2) Makovicky, E. and S. Karup-Møller (1977) Chemistry and crystallography of the lillianite homologeous series. Neues Jahrb. Mineral., Abh., 131, 56–82. (3) (1979) Amer. Mineral., 64, 243 (abs. refs. 1 and 2).