Zincobotryogen $ZnFe^{3+}(SO_4)_2(OH)\cdot 7H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. Prismatic crystals display {010}, {$\bar{1}$ 01}, {120}, and {110} and are elongated along [001], to 2 mm; typically, in radial or globular aggregates.

Physical Properties: *Cleavage*: None. *Tenacity*: n.d. *Fracture*: n.d. Hardness = n.d.
D(meas.) = 2.20(1) D(calc.) = 2.266 Soluble in hot water.

Optical Properties: Transparent. *Color*: Light to dark orange-red. *Streak*: Light yellow.
Luster: Vitreous.
Optical Class: Biaxial (+). α = 1.542(5) β = 1.551(5) γ = 1.587(5) 2V(calc.) = 54.1°
Pleochroism: *X* = colorless, *Y* = light yellow, *Z* = yellow. *Absorption*: *X* < *Y* < *Z*.
Negative elongation. *Dispersion*: Strong *r* > *v*. *Orientation*: *Z* || *b*, *X* ∧ *c* = 10°.

Cell Data: *Space Group*: $P2_1/n$. *a* = 10.504(2) *b* = 17.801(4) *c* = 7.1263(14) β = 100.08(3)° Z = 4

X-ray Powder Pattern: Xitieshan Pb-Zn deposit, Qinghai Province, China.
8.92 (100), 6.32 (77), 5.14 (45), 3.03 (34), 3.21 (31), 5.56 (23), 4.08 (22)

Chemistry:	(1)	(2)
SO_3	38.04	35.08
Al_2O_3	0.04	
Fe_2O_3	18.46	17.49
ZnO	13.75	17.83
MgO	1.52	
MnO	1.23	
H_2O	31.06	29.60
Total	104.10	100.00

(1) Xitieshan Pb-Zn deposit, Qinghai Province, China; average of 10 electron microprobe analyses supplemented by Mössbauer and IR spectroscopy, TG and DTA, H_2O calculated for charge balance and H_2O = 7 pfu; corresponds to $(Zn_{0.73}Mg_{0.16}Mn_{0.08})Fe^{3+}_{0.99}(SO_4)_{2.04}(OH)_{0.82}\cdot 7H_2O$.
(2) $ZnFe^{3+}(SO_4)_2(OH)\cdot 7H_2O$.

Occurrence: A secondary mineral in the oxidation zone of Pb-Zn ore bodies hosted in marble and greenschists.

Association: Jarosite, copiapite, zincocopiapite, fibroferrite, quartz.

Distribution: From the Xitieshan Pb-Zn deposit, northern margin of the Qaidam Basin, Qinghai Province, China; from the Rammelsberg mine, Germany.

Name: As the *zinc*-dominant analog of *botryogen*.

Type Material: Museum of the Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China (KDX067).

References: (1) Zhuming Yang, G. Giester, Qian Mao, Yuguang Ma, Di Zhang, and He Li (2017) Zincobotryogen, $ZnFe^{3+}(SO_4)_2(OH)\cdot 7H_2O$: validation as a mineral species and new data. Mineralogy and Petrology, 111(3), 363-372. (2) (2018) Amer. Mineral., 103, 337 (abs. ref. 1).