Zincocopiapite $ZnFe_4^{3+}(SO_4)_6(OH)_2 \cdot 18H_2O$

Crystal Data: Triclinic, pseudo-orthorhombic. *Point Group:* $\overline{1}$. Thin scaly crystals, to 1 mm, showing {010}, {100}, {101}, {$0\overline{1}1$}, minor {$1\overline{2}0$}, {001}; also in compact massive aggregates.

Physical Properties: *Cleavage:* Perfect on {010}. Hardness = 2 D(meas.) = 2.181 D(calc.) = 2.15

Optical Properties: Transparent to translucent. *Color:* Canary-yellow, yellowish green. *Luster:* Vitreous, pearly to greasy.
Optical Class: Biaxial (+). *Pleochroism:* Strong; X = yellow; Y = colorless; Z = deep canary-yellow. *Orientation:* $X \simeq b$; $Y \wedge c = 39°$; $Z \wedge a = 51°$; OAP $\simeq$ {101}. *Dispersion:* $r > v$, strong. α = 1.532–1.534 β = 1.540–1.554 γ = 1.586–1.592 2V(meas.) = n.d. 2V(calc.) = 44°–78°

Cell Data: *Space Group:* $P\overline{1}$. a = 7.35–7.36 b = 18.16–18.40 c = 7.28 $\alpha = 93.8°–95.83°$ $\beta = 101.5°–102.8°$ $\gamma = 98.5°–99.37°$ Z = 1

X-ray Powder Pattern: Les Vallettes, Switzerland.
18.2 (100), 9.06 (90), 6.06 (50), 3.568 (50), 6.55 (30), 5.20 (30), 4.87 (25)

Chemistry:

	(1)	(2)		(1)	(2)
SO_3	41.23	39.7	CaO	0.20	
Al_2O_3	0.00		Na_2O	0.05	
Fe_2O_3	25.35	26.1	K_2O	0.15	
FeO	0.42		H_2O^+	22.03	
MnO	0.39		H_2O^-	5.58	
ZnO	5.22	6.3	H_2O		27.0
MgO	0.00		Total	100.62	99.1

(1) Xitieshan mine, China; corresponds to $(Zn_{0.82}Fe^{2+}_{0.08}Mn^{2+}_{0.06}Ca_{0.04})_{\Sigma=1.00}Fe^{3+}_{4.00}(SO_4)_{6.50}(OH)_2 \cdot 18.4H_2O$. (2) Les Vallettes, Switzerland; H_2O by TGA; corresponds to $Zn_{0.97}Fe^{3+}_{4.03}(SO_4)_{6.13}(OH)_{1.75} \cdot 17.69H_2O$.

Mineral Group: Copiapite group.

Occurrence: A rare secondary mineral formed in the oxidation zone of a Pb–Zn deposit in a very arid climate (Xitieshan mine, China); a precipitate from thermal hot springs (Kopet-Dag Mountains, Turkmenistan); an alteration product of pyrite and sphalerite in schists (Les Vallettes, Switzerland).

Association: Copiapite, halotrichite, coquimbite, römerite, sideronatrite, melanterite (Xitieshan mine, China); sulfur, gypsum, calcite, pyrite, sphalerite, quartz, "limonite" (Kopet-Dag Mountains, Turkmenistan); boyleite, gunningite, coquimbite, jarosite, melanterite, römerite, siderotil, voltaite, chalcanthite, hexahydrite, gypsum (Les Vallettes, Switzerland).

Distribution: From an undisclosed Pb–Zn deposit [Xitieshan mine, south of Mt. Qilianshan, Chaidamu], Qinghai Province, China. Along the northern front range of the Kopet-Dag Mountains, Turkmenistan. From Băişoara, Romania. At Les Vallettes, Valais, Switzerland.

Name: For its dominant content of *zinc* and relation to *copiapite*.

Type Material: n.d.

References: (1) Tu Kwang-chih, Li Hsi-lin, Hsieh Hsien-deh, and Yin Shu-sen (1964) Zincobotryogen and zincocopiapite, two new varieties of sulphate minerals. Acta Geologica Sinica, 44(1), 99–101. (in Chinese with English abs.). (2) (1964) Amer. Mineral., 49, 1777 (abs. ref. 1). (3) Perroud, P., N. Meisser, and H. Sarp (1987) Présence de zincocopiapite en Valais. Schweiz. Mineral. Petrog. Mitt., 67, 115–117 (in French with English abs.).