Lishizhenite $ZnFe_2^{3+}(SO_4)_4 \cdot 14H_2O$

Crystal Data: Triclinic. *Point Group:* $\overline{1}$. Crystals are tabular to prismatic, elongated along [100], to 8 mm, showing {010}, {100}, {001}, typically in aggregates.

Physical Properties: *Cleavage:* On {010}, nearly perfect; on {001}, poor. Hardness = 3.5 D(meas.) = 2.206 D(calc.) = 2.201 Soluble in H_2O; becomes dull and dark red or yellowish brown on exposure to air.

Optical Properties: Transparent if fresh. *Color:* Pale violet to yellowish brown; colorless in transmitted light. *Streak:* White. *Luster:* Vitreous.
Optical Class: Biaxial (–). *Orientation:* OAP $\wedge$ {010} = 86°. *Dispersion:* $r > v$, strong.
$\alpha = 1.522(2)$ $\beta = 1.568(1)$ $\gamma = 1.578(4)$ 2V(meas.) = 47°

Cell Data: *Space Group:* $P\overline{1}$. $a = 6.477(1)$ $b = 15.298(3)$ $c = 6.309(1)$ $\alpha = 90.20(1)°$ $\beta = 101.11(1)°$ $\gamma = 93.97(1)°$ Z = 1

X-ray Powder Pattern: Xitieshan mine, China.
4.79 (100), 3.61 (78), 5.07 (70), 4.06 (68), 3.98 (38), 2.859 (36), 4.11 (29)

Chemistry:

	(1)	(2)
SO_3	41.00	39.37
Al_2O_3	0.37	
Fe_2O_3	18.28	19.63
FeO	0.11	
MnO	0.76	
ZnO	8.17	10.00
CdO	0.01	
PbO	0.01	
MgO	0.05	
CaO	2.25	
Na_2O	0.02	
H_2O	29.20	31.00
Total	100.23	100.00

(1) Xitieshan mine, China; average of two analyses, Fe^{3+} confirmed by Mössbauer spectroscopy; neglecting CaO as anhydrite impurity, corresponds to $(Zn_{0.86}Mn_{0.09}Fe^{2+}_{0.01}Mg_{0.01})_{\Sigma=0.97}(Fe^{3+}_{1.96}Al_{0.06})_{\Sigma=2.02}S_{4.04}O_{16.13} \cdot 13.87H_2O$. (2) $ZnFe_2(SO_4)_4 \cdot 14H_2O$.

Occurrence: In cavities and veinlets in anhydrite in the oxidation zone of a Pb–Zn deposit.

Association: Anhydrite, römerite, copiapite, sulfur, gypsum, pyrite, quartz.

Distribution: From the Xitieshan Pb–Zn mine, south of Mt. Qilianshan, Chaidamu, Qinghai Province, China.

Name: To honor Li Shizhen (1518–1593), famous Chinese pharmacologist.

Type Material: Department of Geology, Lanzhou University, Lanzhou; Geology Museum, Beijing, China.

References: (1) Wanmao Li and Guoying Chen (1990) Lishizhenite – a new zinc sulfate mineral. Acta Mineral. Sinica, 10(4), 299–305 (in Chinese with English abs.). (2) (1991) Amer. Mineral., 76, 2022 (abs. ref. 1). (3) Wang Qiguang and Li Wanmao (1988) Crystal structure of a new ferric sulfate mineral. Kexue Tongbao, 33(21), 1783–1787 (in English).