Zunyite $Al_{13}Si_5O_{20}Cl(OH,F)_{18}$

Crystal Data: Cubic. *Point Group:* $\bar{4}3m$. As excellent tetrahedral or pseudo-octahedral crystals, may be modified by the cube, up to 2 cm. *Twinning:* On {111}, contact and penetration.

Physical Properties: *Cleavage:* Good on {111}. *Tenacity:* Brittle. Hardness = 7
D(meas.) = 2.874(5) D(calc.) = 2.87–2.90 May fluoresce red under UV.

Optical Properties: Transparent; may be more or less opaque from inclusions. *Color:* Grayish white, flesh-red; colorless in thin section. *Luster:* Vitreous.
Optical Class: Isotropic. $n = 1.592$–1.600

Cell Data: *Space Group:* $F\bar{4}3m$. a = 13.8654–13.8882 Z = 4

X-ray Powder Pattern: Beni-Embarek, Algeria.
8.07 (100), 4.21 (100), 2.679 (90), 1.639 (90), 4.02 (60), 2.840 (50), 2.008 (50)

Chemistry:

	(1)
SiO_2	24.33
Al_2O_3	57.88
Fe_2O_3	0.20
Li_2O	trace
Na_2O	0.24
K_2O	0.10
F	5.61
Cl	2.91
H_2O	10.89
P_2O_5	0.60
$-O = (F,Cl)_2$	3.02
Total	99.74

(1) Zuñi mine, Colorado, USA; corresponds to $Al_{13.21}Fe^{3+}_{0.03}P_{0.10}Si_{4.66}O_{20}Cl_{0.96}[(OH)_{14.04}F_{3.44}]_{\Sigma=17.48}$.

Occurrence: In highly aluminous shales and hydrothermally altered volcanic rocks.

Association: Pyrophyllite, kaolinite, alunite, diaspore, rutile, pyrite, hematite, quartz.

Distribution: In the USA, in the Zuñi mine, near Silverton, San Juan Co., and in the Charter Oak mine, Ouray Co., Colorado; near Silver City, Tintic district, Juab Co., Utah; in the Dome Rock Mountains, near Quartzsite, La Paz Co., Arizona, large crystals. At Postmasburg, Cape Province, South Africa. From Balıkesir, Balıkesir Province, Turkey. At Beni Embarek, Algeria. From Aït Azegour, High Atlas Mountains, Morocco. At Banská Belá, Banská Štiavnica district, Slovakia. In the Embleton quarry, near Cockermouth, Cumbria, England. From Aksakat, Uzbekistan. At Kochi, Iwate Prefecture; Iriyama, Gumma Prefecture; and several mines in Nagano Prefecture, Japan. Several other localities are known.

Name: For the Zuñi mine, Colorado, USA, where it was discovered.

Type Material: National Museum of Natural History, Washington, D.C., USA, 49082.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 436.
(2) Vermaas, F.H.S. (1952) Zunyite from Postmasburg, South Africa. Amer. Mineral., 37, 960–965. (3) Turco, G. (1962) La zunyite: recherches expérimentales physico-chemiques en liaison avec l'étude du nouveau gisement de Beni-Embarek. Bull. Soc. fr. Minéral., 85, 407–458 (in French). (4) Baur, W.H. and T. Ohta (1982) The Si_5O_{16} pentamer in zunyite refined and empirical relations for individual silicon–oxygen bonds. Acta Cryst., 38, 390–401.