Hemihedrite $Pb_{10}Zn(CrO_4)_6(SiO_4)_2F_2$

Crystal Data: Triclinic. *Point Group:* 1. As euhedral crystals exhibiting hemihedral symmetry, up to 1 cm. *Twinning:* Three laws recognized; by reflection on $(\overline{2}\overline{2}3)$, $(0\overline{1}2)$, and $(0\overline{1}0)$, with composition surface (010).

Physical Properties: Hardness = 3 D(meas.) = 6.42 D(calc.) = 6.50

Optical Properties: Translucent to transparent. *Color:* Bright orange, henna-brown, to almost black. *Streak:* Saffron-yellow. *Luster:* Vitreous.
Optical Class: Biaxial (–). *Pleochroism:* Feeble, yellow to orange. *Dispersion:* Noticeable, resembles horizontal dispersion. *Absorption:* $Z > Y > X$. $\alpha = 2.105(5)$ $\beta = 2.32(2)$ $\gamma = 2.65(2)$ 2V(meas.) = 92° 2V(calc.) = 88°

Cell Data: *Space Group:* $P1$. $a = 9.497(1)$ $b = 11.443(2)$ $c = 10.841(2)$ $\alpha = 120°30'$ $\beta = 92°06'$ $\gamma = 55°50'$ Z = 1

X-ray Powder Pattern: Florence Lead-Silver mine, Arizona, USA.
3.301 (100), 4.872 (90), 4.364 (80), 3.164 (80), 3.102 (80), 2.924 (55), 2.849 (45)

Chemistry:

	(1)	(2)
SiO_2	3.2	3.93
CrO_3	19.5	19.64
ZnO	[3.8]	2.66
PbO	70.5	73.05
F	5.1	1.24
H_2O	n.d.	
$-O = F_2$	2.1	0.52
Total	[100.0]	100.00

(1) Florence Lead-Silver mine, Arizona, USA; average of several analyses, corrected for $PbMoO_4$ and $PbCO_3$ impurities, ZnO originally given as 3.93%; recalculated to 100.0%.
(2) $Pb_{10}Zn(CrO_4)_6(SiO_4)_2F_2$.

Polymorphism & Series: Forms a series with iranite.

Occurrence: Formed through oxidation of galena, sphalerite, and pyrite, in the oxide zone of hydrothermal lead-bearing veins.

Association: Cerussite, phoenicochroite, vauquelinite, willemite, wulfenite, galena, sphalerite, pyrite, tennantite, chalcopyrite (Florence Lead-Silver mine, Arizona, USA).

Distribution: From the Florence Lead-Silver mine, Tortilla Mountains, Pinal Co., and the Pack Rat claim, the Moon Anchor mine, and the Potter-Cramer property, Belmont Mountains, Maricopa Co., Arizona; also from near Boulder City, Clark Co., Nevada, USA. In the Seh-Changi mine, near Neyband, Khorassan, Iran.

Name: In allusion to its distinctive *hemihedral* morphology.

Type Material: The Natural History Museum, London, England, 1968,246; University of Arizona, Tucson, Arizona; National Museum of Natural History, Washington, D.C., USA, 141026.

References: (1) Williams, S.A. and J.W. Anthony (1970) Hemihedrite, a new mineral from Arizona. Amer. Mineral., 55, 1088–1102. (2) McLean, W.J. and J.W. Anthony (1970) The crystal structure of hemihedrite. Amer. Mineral., 55, 1103–1114. (3) Cesbron, F. and S.A. Williams (1980) Iranite–hemihedrite, bellite, phoenicochroite, vauquelinite et fornacite: synthèse et nouvelles données. Bull. Minéral., 103, 469–477 (in French with English abs.).