Crimsonite $PbFe^{3+}_2(PO_4)_2(OH)_2$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As blades, to 0.1 mm, flattened on {100}, somewhat elongated along [010] and displaying {100}, {101} and {011}; in sub-parallel aggregates.

Physical Properties: *Cleavage*: None observed; imperfect on {101} (by analogy to carminite). *Fracture*: Irregular. *Tenacity*: Brittle. Hardness = ~ 3.5 D(meas.) = n.d. D(calc.) = 5.180

Optical Properties: Transparent. *Color*: Deep red with a slight purplish cast. *Streak*: Light purplish orange. *Luster*: Adamantine.
Optical Class: Biaxial (+). n = [2.026 by Gladstone-Dale calculation.] α(calc.) = [2.02] β(calc.) = [2.026] γ(calc.) = [2.032] 2V(calc.) = 85.5(5)° *Orientation*: $X = b$; $Y = a$; $Z = c$. *Pleochroism*: X = light orange, Y = light yellow, Z = red brown. *Absorption*: $Y < X < Z$.

Cell Data: *Space Group*: *Cccm*. a = 16.2535(13) b = 7.4724(4) c = 12.1533(9) Z = 8

X-ray Powder Pattern: Silver Coin mine, Valmy, Humboldt County, Nevada, USA.
3.190 (100), 2.502 (77), 3.485 (64), 2.902 (54), 2.268 (54), 4.53 (45), 5.86 (42)

Chemistry:	(1)	(2)
PbO	40.69	41.12
CaO	0.60	
ZnO	0.72	
CuO	0.13	
Fe_2O_3	23.36	29.42
Al_2O_3	0.34	
V_2O_5	0.70	
As_2O_5	12.05	
P_2O_5	16.03	26.15
SO_3	0.33	
H_2O	[3.64]	3.32
Total	98.59	100.00

(1) Silver Coin mine, Valmy, Humboldt County, Nevada, USA; average of 22 electron microprobe analyses, H_2O calculated; corresponds to $(Pb_{1.06}Ca_{0.06})_{\Sigma=1.12}(Fe_{1.71}Zn_{0.05}Al_{0.04}Cu_{0.01})_{\Sigma=1.81}(P_{1.32}As_{0.61}V_{0.05}S_{0.02})_{\Sigma=2.00}O_8[(OH)_{1.64}(H_2O)_{0.36}]_{\Sigma=2.00}$. (2) $PbFe^{3+}_2(PO_4)_2(OH)_2$.

Occurrence: A low-temperature, secondary, oxidation-zone mineral.

Association: Fluorwavellite, goethite, hematite, hentschelite, plumbogummite, variscite, quartz.

Distribution: From the Phosphate stope, Silver Coin mine, Valmy, Iron Point district, Humboldt County, Nevada, USA.

Name: Alludes to the mineral's deep red (crimson) color and the fact that it is the phosphate analogue of carminite, a mineral with a very similar deep red color and whose name is also based upon its color (carmine).

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (65558).

References: (1) Kampf, A.R., P.M. Adams, S.J. Mills, and B.P. Nash (2016) Crimsonite, $PbFe^{3+}_2(PO_4)_2(OH)_2$, the phosphate analogue of carminite from the Silver Coin mine, Valmy, Nevada, USA. Mineral. Mag., 80(6), 925-935. (2) (2017) Amer. Mineral., 102, 694-695 (abs. ref. 1).