

Fernandinite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Rare crystals are platy, rectangular, to 10 μm ; fibrous, cryptocrystalline, porous massive.

Physical Properties: Hardness = Soft. $D(\text{meas.}) = 2.78(5)$ $D(\text{calc.}) = 3.07$ Somewhat soluble in cold H_2O , giving a yellow solution.

Optical Properties: Opaque to translucent. *Color:* Dull green; light green, dark olive-green, brownish green in transmitted light. *Luster:* Submetallic.

Optical Class: Biaxial; strong birefringence. $n = 2.05$ $2V(\text{meas.}) = \text{n.d.}$

Cell Data: *Space Group:* $C2/m$. $a = 11.680(1)$ $b = 3.6537(4)$ $c = 11.023(2)$
 $\beta = 105.00(2)^\circ$ $Z = [1]$

X-ray Powder Pattern: Minasragra, Peru; very close to corvusite.
10.68 (100), 3.483 (26), 1.836 (8), 2.826 (7), 1.949 (6), 3.545 (4), 2.549 (4)

Chemistry:

	(1)	(2)
V_2O_5	83.7	76.6
SiO_2	2.3	1.0
TiO_2	0.17	0.40
Al_2O_3	1.4	0.7
Fe_2O_3	0.5	1.5
CaO	5.6	5.7
Na_2O	0.00	0.04
K_2O	0.2	0.5
H_2O	[6.1]	[13.6]
Total	[100.0]	[100.0]

(1) Minasragra, Peru; by electron microprobe, average of five analyses, all V as V_2O_5 , H_2O by difference; assuming Si and Al as impurities, $\text{V}^{5+}:\text{V}^{4+}$ from crystal-structure analysis, corresponds to $(\text{Ca}_{0.86}\text{K}_{0.04})_{\Sigma=0.90}(\text{V}_{6.48}^{5+}\text{V}_{1.39}^{4+}\text{Fe}_{0.05}^{2+}\text{Ti}_{0.02})_{\Sigma=7.94}\text{O}_{20} \cdot 2.5\text{H}_2\text{O}$. (2) Do.; by electron microprobe, average of 10 analyses, all V as V_2O_5 , H_2O by difference; $\text{V}^{5+}:\text{V}^{4+}$ from crystal-structure analysis, corresponds to $(\text{Ca}_{0.92}\text{K}_{0.04}\text{Na}_{0.01})_{\Sigma=0.97}(\text{V}_{6.73}^{5+}\text{V}_{0.88}^{4+}\text{Fe}_{0.34}^{2+}\text{Ti}_{0.05})_{\Sigma=8.00}\text{O}_{20} \cdot 4.5\text{H}_2\text{O}$.

Occurrence: In a rich vanadium deposit in fissures that cut red shales and that were probably filled by a remobilized asphaltite deposit.

Association: Hewettite, quartz.

Distribution: From Minasragra, 46 km from Cerro de Pasco, Peru. In the USA, at the Monument No. 2 mine, Monument Valley, Apache Co., Arizona; from the Cactus Rat mine group, Yellow Cat district, 24 km southeast of Thompson, Grand Co., Utah; in the Spring Creek Mesa area, Uravan district, Montrose Co., Colorado.

Name: For Eulagio E. Fernandini, formerly an owner of the Minasragra, Peru deposit.

Type Material: Harvard University, Cambridge, Massachusetts, 101718; National Museum of Natural History, Washington, D.C., USA, 87661, R5706.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1062. (2) Evans, H.T., Jr. and J.M. Hughes (1990) Crystal chemistry of the natural vanadium bronzes. *Amer. Mineral.*, 75, 508–521, esp. 516–517. (3) Evans, H.T., Jr., J.E. Post, D.R. Ross, and J.A. Nelen (1994) The crystal structure and crystal chemistry of fernandinite and corvusite. *Can. Mineral.*, 32, 339–351.