Melanovanadite $Ca(V^{5+},V^{4+})_4O_{10}\cdot 5H_2O$

Crystal Data: Triclinic. *Point Group:* $\overline{1}$. Prismatic crystals, to 2 mm, striated and elongated along [001], with prominent but rounded prism zone, complexly terminated; in radiating aggregates and rosettes, velvety.

Physical Properties: *Cleavage:* Perfect on {010}. *Tenacity:* Brittle. Hardness = 2.5
D(meas.) = 2.55 D(calc.) = 2.53

Optical Properties: Opaque, translucent in very thin flakes. *Color:* Black; dark reddish brown in transmitted light. *Streak:* Dark reddish brown. *Luster:* Submetallic.
Optical Class: Biaxial (–). *Pleochroism:* Distinct; X = light reddish brown; $Y = Z$ = dark reddish brown. *Orientation:* $Z = b$; $Y \wedge c = 15°$. $\alpha = 1.73$ $\beta = 1.96$ $\gamma = 1.98$
2V(meas.) = Medium.

Cell Data: *Space Group:* $P\overline{1}$. $a = 6.360(2)$ $b = 18.090(9)$ $c = 6.276(2)$ $\alpha = 110.18(4)°$ $\beta = 101.62(3)°$ $\gamma = 82.86(4)°$ Z = [2]

X-ray Powder Pattern: Minasragra, Peru.
8.40 (100), 4.208 (55), 2.974 (50), 2.473 (50), 3.109 (45), 4.120 (40), 3.182 (40)

Chemistry: Composition established by crystal-structure analysis; the mineral contains interlayer H_2O, easily displaced.

Occurrence: In altered black shale in a very rich vanadium deposit (Minasragra, Peru); in Colorado Plateau-type U–V deposits.

Association: Pascoite, pyrite, copper, gypsum, patrónite, sherwoodite (Minasragra, Peru); duttonite (Peanut mine, Colorado, USA).

Distribution: At Minasragra, 46 km from Cerro de Pasco, Peru. In the USA, in the Mesa No. 1, Mesa No. 5, and Kerr-McGee 4-1 mines, Lukachukai Mountains, Apache Co., Arizona; the Jackpile mine, Valencia Co., New Mexico; the Jo Dandy, Bitter Creek, and Peanut mines, Uravan district, Montrose Co., and the Garfield mines, Garfield Co., Colorado; and the Juniper mine, Thompsons district, Grand Co., Utah.

Name: From the Greek for *black*, for the color, and VANADium in the composition.

Type Material: Harvard University, Cambridge, Massachusetts, 90452; American Museum of Natural History, New York City, New York, 19310; National Museum of Natural History, Washington, D.C., USA, 138067, 160076.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1058–1060. (2) Bayliss, P. and J.M. Hughes (1985) X-ray diffraction data for melanovanadite. Amer. Mineral., 70, 644–645. (3) Konnert, J.A. and H.T. Evans, Jr. (1987) Crystal structure and crystal chemistry of melanovanadite, a natural vanadium bronze. Amer. Mineral., 72, 637-644. (4) Evans, H.T., Jr. and J.M. Hughes (1990) Crystal chemistry of the natural vanadium bronzes. Amer. Mineral., 75, 508–521, esp. 519.