Duttonite $V^{4+}O(OH)_2$

Crystal Data: Monoclinic; pseudo-orthorhombic. *Point Group:* $2/m$. In crusts and masses of six-sided, platy, pseudo-orthorhombic crystals, to 1 mm, flattened ∥ {001}, with {100} and {110}.

Physical Properties: *Cleavage:* {001}, good to perfect. Hardness = ∼2.5 D(meas.) = n.d. D(calc.) = 3.24

Optical Properties: Transparent. *Color:* Pale brown, becoming greenish with alteration. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Pleochroism:* X = pale pinkish brown; Y = pale yellow-brown; Z = pale brown. *Orientation:* $X = a$; $Y = c$; $Z = b$. *Dispersion:* $r < v$, moderate. $\alpha = 1.810(3)$ $\beta = 1.900(3)$ $\gamma = > 2.01$ 2V(meas.) = ∼60°

Cell Data: *Space Group:* $I2/c$. $a = 8.80(2)$ $b = 3.95(1)$ $c = 5.96(2)$ $\beta = 90°40(5)'$ Z = 4

X-ray Powder Pattern: Peanut mine, Colorado, USA.
4.40 (100), 3.61 (85), 1.838 (21), 2.480 (15), 2.454 (15), 1.974 (14), 3.29 (13)

Chemistry:

	(1)	(2)
V_2O_4	78.1	82.16
V_2O_3	2.7	
FeO	0.4	
H_2O	18.8	17.84
Total	[100.0]	100.00

(1) Peanut mine, Colorado, USA; by spectrophotometry, H_2O by CHN analyzer; recalculated to 100% after deduction of 4.2% insoluble selenium and quartz. (2) $VO(OH)_2$.

Occurrence: A secondary mineral formed by the low-temperature hydrothermal alteration of vanadium-bearing minerals.

Association: Melanovanadite, lenoblite, selenium, simplotite, montroseite, paramontroseite, uraninite, coffinite (Peanut mine, Colorado, USA); hewettite, fervanite, schoderite, metaschoderite, straczekite (Wilson Springs, Arkansas, USA).

Distribution: In the USA, found at the Peanut mine, Bull Canyon area, Uravan district, Montrose Co., and at the Sundown claim, Gypsum Valley, Slick Rock district, San Miguel Co., Colorado; in the Wilson Springs (Potash Sulphur Springs) mine, Garland Co., Arkansas. From the Urcal deposit, La Rioja, Argentina. At the Mounana uranium mine, Franceville, Gabon.

Name: Honors Captain Clarence Edward Dutton (1841–1912), American geologist with the U.S. Geological Survey, an early worker on the Colorado Plateau.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 134144.

References: (1) Thompson, M.E., C.H. Roach, and R. Meyrowitz (1956) Duttonite, new vanadium mineral from Peanut mine, Montrose County, Colorado. Science, 123, 990. (2) (1956) Amer. Mineral., 41, 958 (abs. ref. 1). (3) Thompson, M.E., C.H. Roach, and R. Meyrowitz (1957) Duttonite, a new quadrivalent vanadium oxide from the Peanut mine, Montrose County, Colorado. Amer. Mineral., 42, 455–460. (4) Evans, H.T., Jr. and M.E. Mrose (1958) The crystal structures of three new vanadium oxide minerals. Acta Cryst., 11, 56–58.