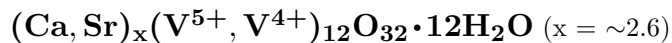


## Hendersonite



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**Crystal Data:** Orthorhombic. *Point Group:*  $2/m2/m2/mor\ mm2$ . As microscopic fibers or blades, more rarely as elongated six-sided platy crystals; in bundles of fibers or subparallel aggregates.

**Physical Properties:** *Cleavage:* Perfect  $\parallel$  crystal platiness. *Tenacity:* Fibers smear easily. Hardness = 2.5  $D(\text{meas.}) = 2.77\text{--}2.79$   $D(\text{calc.}) = 2.805$

**Optical Properties:** Semitransparent. *Color:* Dark greenish black to black, turning brown on exposure to air. *Streak:* Dark brownish green. *Luster:* Vitreous, pearly to subadamantine. *Optical Class:* Biaxial (-). *Pleochroism:* Moderate;  $X =$  yellowish green;  $Y =$  green;  $Z =$  yellowish brown to brown. *Orientation:*  $X = a$ ;  $Y = b$ ;  $Z = c$ . *Dispersion:*  $r > v$ , weak.  $\alpha = < 2.01$   $\beta = > 2.01$   $\gamma = > 2.01$   $2V(\text{meas.}) = \text{Medium}$ .

**Cell Data:** *Space Group:*  $Pn\ m\ or\ Pn\ a_2\ 1$ .  $a = 12.40(4)$   $b = 18.92(8)$   $c = 10.77(3)$   $Z = 3$

**X-ray Powder Pattern:** Eastside mines, New Mexico, USA. 9.43 (100), 3.108 (36), 4.70 (17), 2.257 (16), 6.20 (11), 5.18 (11), 2.309 (11)

Chemistry:	(1)	(2)
$\text{V}_2\text{O}_5$	64.6	63.44
$\text{V}_2\text{O}_4$	8.1	8.01
CaO	9.5	
SrO	1.3	
CaO + SrO		8.84
$\text{H}_2\text{O}$	14.6	14.45
insol.	0.6	4.28
Total	98.7	99.02

(1) J.J. mine, Colorado, USA;  $\text{H}_2\text{O}^-$  7.7% determined separately; corresponds to  $(\text{Ca}_{2.52}\text{Sr}_{0.20})_{\Sigma=2.72}\text{V}_{12.00}\text{O}_{32} \cdot 12.04\text{H}_2\text{O}$ . (2) Eastside mines, New Mexico, USA;  $\text{H}_2\text{O}^-$  7.52% determined separately; corresponds to  $(\text{Ca, Sr})_{2.40}\text{V}_{12.12}\text{O}_{32} \cdot 12.12\text{H}_2\text{O}$ .

**Occurrence:** In thin seams and veinlets through sandstone at the interface between partially oxidized and unoxidized ore in Colorado Plateau-type U–V deposits.

**Association:** Paramontroseite, simplotite, melanovanadite, sherwoodite, corvusite, pyrite, marcasite (J.J. mine, Colorado, USA).

**Distribution:** In the USA, from the J.J. mine, Paradox Valley, Uravan district, Montrose Co., Colorado; and near the Nelson mine, Eastside mines, Carrizo Mountains, San Juan Co., New Mexico.

**Name:** Honors Dr. Edward Porter Henderson (1898–1992), formerly Curator of Meteorites at the Smithsonian Institution, Washington, D.C., USA, who contributed to the knowledge of the mineralogy of U–V deposits.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 115888, 121955, 162609.

**References:** (1) Lindberg, M.L., A.D. Weeks, M.E. Thompson, D.P. Elston, and R. Meyrowitz (1962) Hendersonite, a new calcium vanadyl vanadate from Colorado and New Mexico. *Amer. Mineral.*, 47, 1252–1272. (2) Evans, H.T., Jr. and J.M. Hughes (1990) Crystal chemistry of the natural vanadium bronzes. *Amer. Mineral.*, 75, 508–521, esp. 513–515.