Grantsite $(Na, Ca)_x(V^{5+}, V^{4+})_6O_{16} \cdot 4H_2O$ (x = ~2.3)

Crystal Data: Monoclinic. *Point Group:* $2/m$. As aggregates of microscopic fibrous or bladed crystals elongated on [010]. Also as botryoidal crusts.

Physical Properties: *Tenacity:* Smears easily. Hardness = Soft. D(meas.) = 2.94(1) D(calc.) = 2.95

Optical Properties: Translucent. *Color:* Dark olive-green to greenish black; shades of green and brown in transmitted light. *Streak:* Olive-green to brownish green. *Luster:* Silky or pearly to subadamantine.
Optical Class: Biaxial (–). *Pleochroism:* X = green; Y = greenish brown; Z = brown. *Orientation:* $Z = b$. *Absorption:* $Z > Y > X$. $\alpha = 1.82(1)$ $\beta = > 2.0$ $\gamma = > 2.0$ 2V(meas.) = n.d.

Cell Data: *Space Group:* $P2_1/m$. $a = 12.429$ $b = 3.604$ $c = 17.542$ $\beta = 95.33°$ Z = [2]

X-ray Powder Pattern: Golden Cycle mine, Colorado, USA.
8.74 (100), 3.606 (28), 12.4 (18), 3.008 (14), 2.869 (12), 2.280 (11), 4.37 (10)

Chemistry:

	(1)	(2)
UO_3	0.3	
V_2O_5	65.2	65.6
V_2O_4	10.8	9.3
Fe_2O_3		0.2
CaO	4.4	2.9
SrO	0.1	< 0.1
Na_2O	8.3	8.2
K_2O		< 0.1
H_2O^+	10.1	11.4
CO_2	0.6	
insol.	0.3	1.9
Total	100.1	99.5

(1) F-33 mine, New Mexico, USA; corresponds to $Na_{1.90}Ca_{0.46}Sr_{0.01}V_{6.02}O_{16} \cdot 3.49H_2O$.
(2) Golden Cycle mine, Colorado, USA; corresponds to $Na_{1.91}Ca_{0.38}V_{6.03}O_{16} \cdot 4.59H_2O$.

Occurrence: In partially oxidized portions of sandstone seams and coalified wood in vanadiferous uranium deposits of the Colorado Plateau type.

Association: Häggite, paramontroseite, corvusite, rauvite, hewettite, carnotite, tyuyamunite.

Distribution: In the USA, from the F-33 mine, Grants district, McKinley Co., New Mexico; the Golden Cycle mine, Atkinson Mesa, Uravan district, and the La Salle mine, Club Mesa, Montrose Co., Colorado; and in the Parco No. 23 mine, about 21 km southeast of Thompson, Grand Co., Utah.

Name: For the town of Grants, New Mexico, USA, near which it was first discovered.

Type Material: National Museum of Natural History, Washington, D.C., USA, 121956.

References: (1) Weeks, A.D., M.L. Lindberg, A.H. Truesdell, and R. Meyrowitz (1964) Grantsite, a new hydrated sodium calcium vanadate from New Mexico, Colorado, and Utah. Amer. Mineral., 49, 1511–1526. (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.