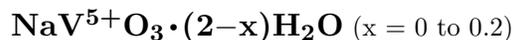


Munirite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals, to 3 mm, in radiating to spherical fibrous aggregates.

Physical Properties: Hardness = n.d. $D(\text{meas.}) = 2.43$ $D(\text{calc.}) = [2.44]$ Soluble in H_2O .

Optical Properties: Semitransparent. *Color:* White, tinged apple-green; colorless in transmitted light. *Luster:* Pearly.

Optical Class: Biaxial (-). *Orientation:* $X = c$; $Y = a$; $Z = b$. $\alpha = 1.692$ $\beta = 1.757$
 $\gamma = 1.800$ $2V(\text{meas.}) = 75^\circ$

Cell Data: *Space Group:* $P2_1/a$ (synthetic). $a = 16.72(2)$ $b = 3.636(3)$ $c = 8.015(6)$
 $\beta = 111.0(1)^\circ$ $Z = 4$

X-ray Powder Pattern: Bhimber area, Pakistan.

7.85 (100), 3.297 (90), 2.685 (80), 4.134 (70), 2.984 (70), 6.74 (50), 1.820 (50)

Chemistry:

	(1)	(2)
V_2O_5	67.46	58.24
Na_2O	22.91	19.84
H_2O	10.26	21.92
Total	100.63	100.00

(1) Bhimber area, Pakistan; by AA, H_2O by the Penfield method, yielding Na:V = 1:1.

(2) $\text{NaVO}_3 \cdot 1.9\text{H}_2\text{O}$.

Occurrence: On sandstone, presumably formed from oxidation of vanadium-bearing primary uranium minerals.

Association: n.d.

Distribution: From the Bhimber area, Azad Kashmir, Pakistan.

Name: Honors Munir Ahmad Khan, Chairman, Pakistan Atomic Energy Commission.

Type Material: Atomic Energy Minerals Centre, Peshawar, Pakistan; The Natural History Museum, London, England, 1983,196.

References: (1) Butt, K.A. and K. Mahmood (1983) Munirite, naturally occurring sodium vanadium oxide hydrate, a new mineral. *Mineral. Mag.*, 47, 391–392. (2) (1984) *Amer. Mineral.*, 69, 812 (abs. ref. 1). (3) Björnberg, A. and B. Hedman (1977) The crystal structure of $\text{NaVO}_3 \cdot 1.89\text{H}_2\text{O}$. *Acta Chem. Scand.*, A31, 579–584. (4) Evans, H.T., Jr. (1988) The crystallography of munirite, $\text{NaVO}_3 \cdot (2-x)\text{H}_2\text{O}$. *Mineral. Mag.*, 52, 716–717.