Mikehowardite $Fe^{3+}_4(VO_4)_4(H_2O)_2 \cdot H_2O$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As equant prisms with slightly sloping terminations to 0.15 mm on concretionary masses.

Physical Properties: *Cleavage*: Very good on {100}, two undetermined good. *Tenacity*: Brittle. *Fracture*: Irregular, stepped. Hardness = 3.5 D(meas.) = 3.19(2) D(calc.) = 3.263

Optical Properties: Translucent. *Color*: Very dark brown. *Streak*: Yellow-orange.
Luster: Subadamantine.
Optical Class: Biaxial. *n*(calc.) = 2.034 *Pleochroism*: Slight, shades of brown-orange.

Cell Data: *Space Group: P*$\bar{1}$. a = 6.655(2) b = 6.669(1) c = 9.003(2) α = 76.515(5)° β = 84.400(6)° γ = 75.058(5)° Z = 1

X-Ray Diffraction Pattern: North Wilson pit, Wilson Springs mine, Wilson Springs, Garland Co., Arkansas, USA.
6.449 (100), 3.198 (88), 8.799 (86), 2.909 (59), 2.982 (50), 2.792 (31), 2.145 (30)

Chemistry:

	(1)	(2)
K_2O	0.75	
CaO	0.13	
Fe_2O_3	41.83	43.32
Mn_2O_3	0.32	
P_2O_5	3.28	
V_2O_5	46.27	49.34
H_2O	[7.72]	7.33
Total	100.30	100.00

(1) North Wilson pit, Wilson Springs mine, Wilson Springs, Garland Co., Arkansas, USA. average electron microprobe analysis, H_2O calculated from structure; corresponds to $K_{0.11}Ca_{0.02}Fe^{3+}_{3.78}Mn^{3+}_{0.03}V_{3.67}P_{0.33}O_{18.87}H_{6.18}$. (2) $Fe^{3+}_4(VO_4)_4(H_2O)_2 \cdot H_2O$.

Occurrence: A secondary mineral (previously misidentified as fervanite) in a vanadium deposit formed by potassic fenitization near an alkaline intrusion.

Association: Donowensite, bokite.

Distribution: From the North Wilson pit, Wilson Springs mine (also known as Union Carbide mine), Wilson Springs (also known as Potash Sulfur Springs), Garland Co., Arkansas, USA.

Name: Honors James Michael (*Mike*) *Howard* (b. 1949), staff economic geologist and field mineralogist, Arkansas Geological Commission for 39 years. Mr. Howard is a specialist in Arkansas species and collecting, particularly micro-mineral crystals.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (75041 and 75042).

References: (1) Kampf, A.R., J.M. Hughes, B.P. Nash, and J.B. Smith (2022) Donowensite, $Ca(H_2O)_3Fe^{3+}_2(V_2O_7)_2$, and mikehowardite, $Fe^{3+}_4(VO_4)_4(H_2O)_2 \cdot H_2O$, two new vanadium minerals from the Wilson Springs vanadium mine, Wilson Springs, Arkansas, USA. Can. Mineral., 60, 543-554.