Wetherillite $Na_2Mg(UO_2)_2(SO_4)_4 \cdot 18H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. Crystals elongated on [010] and flattened on $\{10\bar{1}\}$; as divergent sprays and jackstraw aggregates, to 1 mm.

Physical Properties: *Cleavage*: Perfect on $\{10\bar{1}\}$ and fair on {010}. *Fracture*: Conchoidal to curved. *Tenacity*: Brittle. Hardness = ~ 2 D(meas.) = n.d. D(calc.) = 2.626 Moderately hygroscopic, easily soluble in H_2O.

Optical Properties: Transparent. *Color*: Pale greenish yellow. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (+). $\alpha = 1.498(1)$ $\beta = 1.508(1)$ $\gamma = 1.519(1)$ 2V(meas.) = 88(1)° 2V(calc.) = 87.9° *Orientation*: $Z = b$, $X \wedge a = 54°$ in obtuse β. *Dispersion*: $r < v$, distinct. *Absorption*: $X < Y \approx Z$. *Pleochroism*: X = colorless, $Y = Z$ = pale yellow-green.

Cell Data: *Space Group*: $P2_1/c$. $a = 20.367(1)$ $b = 6.8329(1)$ $c = 12.903(3)$ $\beta = 107.879(10)°$ Z = 2

X-ray Powder Pattern: Blue Lizard mine, White Canyon district, San Juan County, Utah, USA. 9.74 (100), 4.80 (64), 6.46 (50), 3.510 (50), 6.01 (48), 3.202 (47), 5.41 (40)

Chemistry:	(1)	(2)
Na_2O	4.56	4.70
MgO	1.75	3.06
FeO	0.49	
CuO	0.62	
ZnO	1.43	
UO_3	44.24	43.38
SO_3	23.35	24.28
H_2O	[24.13]	24.59
Total	100.57	100.00

(1) Blue Lizard mine, White Canyon district, San Juan County, Utah, USA; average of 8 electron microprobe analyses supplemented by Raman spectroscopy, H_2O calculated from stoichiometry; corresponding to $Na_{1.98}(Mg_{0.58}Zn_{0.24}Cu_{0.11}Fe^{2+}_{0.09})_{\Sigma=1.02}(U_{1.04}O_2)_2(S_{0.98}O_4)_4(H_2O)_{18}$.
(2) $Na_2Mg(UO_2)_2(SO_4)_4 \cdot 18H_2O$.

Occurrence: As efflorescent crusts, on the surfaces of mine walls, derived from the oxidation of primary minerals (uraninite, pyrite, chalcopyrite, bornite and covellite) in a relatively humid underground environment.

Association: Bobcookite, boyleite, chalcanthite, dietrichite, gypsum, hexahydrite, johannite, pickeringite, rozenite.

Distribution: From Blue Lizard mine, Red Canyon, White Canyon district, San Juan County, Utah, USA.

Name: Honors John Wetherill (1866-1944), discoverer of the deposit that was exploited as the Blue Lizard mine, and for George W. Wetherill (1925-2006) for his seminal work on the spontaneous fission of uranium which led to techniques for dating of rocks based on radioactive decay.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (64164, 64172) and the A. E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4574/1).

References: (1) Kampf, A.R., J. Plášil, A.V. Kasatkin, and J. Marty (2015) Bobcookite, $NaAl(UO_2)_2(SO_4)_4 \cdot 18H_2O$ and wetherillite, $Na_2Mg(UO_2)_2(SO_4)_4 \cdot 18H_2O$, two new uranyl sulfate minerals from the Blue Lizard mine, San Juan County, Utah, USA. Mineral. Mag., 79(3), 695-714. (2) (2016) Amer. Mineral., 101, 1240-1241 (abs. ref. 1).