Fermiite $Na_4(UO_2)(SO_4)_3 \cdot 3H_2O$

Crystal Data: Orthorhombic. *Point Group*: *mm*2. As prisms elongated along [010] to ~ 0.5 mm and in subparallel or irregular aggregates. Crystals display {101}, {011}, {110}, {010}, and {001}. *Twinning*: Penetration twins by 180° rotation on [010].

Physical Properties: *Cleavage*: None. *Fracture*: Conchoidal. *Tenacity*: Brittle. Hardness = 2.5 D(meas.) = 3.23(2) D(calc.) = 3.275 Slightly deliquescent and easily soluble in H_2O. Bright greenish white fluorescence under UV.

Optical Properties: Transparent. *Color*: Greenish yellow. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (+). $\alpha = 1.527$ $\beta = 1.534$ $\gamma = 1.567$ 2V(meas.) = 51(1)° 2V(calc.) = 50° *Dispersion*: Distinct, $r < v$. *Orientation*: $X = b$, $Y = c$, $Z = a$. *Absorption*: $X = Y < Z$. *Pleochroism*: $X = Y$ = colorless, Z = pale greenish yellow.

Cell Data: *Space Group*: $Pmn2_1$. $a = 11.8407(12)$ $b = 7.8695(5)$ $c = 15.3255(19)$ $Z = 4$

X-ray Powder Pattern: Blue Lizard mine, White Canyon district, San Juan County, Utah, USA. 7.01 (100), 3.476 (85), 3.131 (57), 3.336 (55), 6.00 (49), 7.71 (43), 4.70 (42)

Chemistry:	(1)	(2)
Na_2O	17.10	17.60
UO_3	42.77	40.62
SO_3	33.85	34.11
H_2O	[7.70]	7.67
Total	101.42	100.00

(1) Blue Lizard mine, White Canyon district, San Juan County, Utah, USA; average of 6 electron microprobe analyses supplemented by Raman spectroscopy, H_2O calculated from stoichiometry; corresponding to $Na_{3.88}(U_{1.05}O_2)(S_{0.99}O_4)_3(H_2O)_3$. (2) $Na_4(UO_2)(SO_4)_3 \cdot 3H_2O$.

Occurrence: A secondary mineral from post-mining oxidation of primary uraninite, pyrite, chalcopyrite, bornite, and covellite deposited as replacement of wood and other organic material and as disseminations in the enclosing sandstone.

Association: Oppenheimerite, blödite, bluelizardite, chalcanthite, epsomite, gypsum, hexahydrite, kröhnkite, manganoblödite, sideronatrite, tamarugite, wetherillite.

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

Name: Honors Italian-American theoretical and experimental physicist Enrico Fermi (1901-1954), well known for his work for the Manhattan Project during World War II.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (65546-65548), and the A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (94621).

References: (1) Kampf, A.R., J. Plašil, A.V. Kasatkin, J. Marty and J. Čejka (2015) Fermiite, $Na_4(UO_2)(SO_4)_3 \cdot 3H_2O$ and oppenheimerite, $Na_2(UO_2)(SO_4)_2 \cdot 3H_2O$, two new uranyl sulfate minerals from the Blue Lizard mine, San Juan County, Utah, USA. Mineral. Mag., 79(5), 1123-1142. (2) (2016) Amer. Mineral., 101, 1017 (abs. ref. 1).