Oppenheimerite $Na_2(UO_2)(SO_4)_2 \cdot 3H_2O$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As prisms elongated along [$11\bar{1}$] to several mm and in subparallel or irregular aggregates. Crystals display {100}, {010}, {001}, {101}, {011}, {110} and {$10\bar{1}$}.

Physical Properties: *Cleavage*: Good on {$1\bar{1}$ 0}, {011} and {101}. *Fracture*: Irregular. *Tenacity*: Slightly sectile. Hardness = 2.5 D(meas.) = n.d. D(calc.) = 3.360
Slightly deliquescent and easily soluble in H_2O. Bright greenish white fluorescence under UV.

Optical Properties: Transparent. *Color*: Pale greenish yellow. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (+). $\alpha = 1.537(1)$ $\beta = 1.555(1)$ $\gamma = 1.594(1)$ 2V(meas.) = 72(2)° 2V(calc.) = 70° *Dispersion*: Moderate, $r > v$, inclined. *Pleochroism*: X = very pale greenish yellow, Y = pale greenish yellow, Z = greenish yellow. *Absorption*: $X < Y < Z$.

Orientation: $X \approx \perp$ {101}, $Z \approx$ [$11\bar{1}$].

Cell Data: *Space Group*: $P\bar{1}$. $a = 7.9576(6)$ $b = 8.1952(6)$ $c = 9.8051(7)$ $\alpha = 65.967(5)°$ $\beta = 70.281(5)°$ $\gamma = 84.516(6)°$ Z = 2

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	10.94	11.03
UO_3	50.77	50.80
SO_3	29.75	28.55
H_2O	[9.85]	9.62
Total	101.31	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 $Na_{1.94}(U_{0.97}O_2)(S_{1.02}O_4)_2(H_2O)_3$. (2) $Na_2(UO_2)(SO_4)_2 \cdot 3H_2O$.

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: Fermiite, 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 American physicist Dr. J. Robert Oppenheimer (1904-1967), former Professor of Physics concurrently at the University of California, Berkeley and the California Institute of Technology, USA. Well known for his work for the Manhattan Project during World War II, he became an outspoken critic of the development of the hydrogen bomb.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (65549-65551), and the A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (94622).

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).