Ewingite $Mg_8Ca_8(UO_2)_{24}(CO_3)_{30}O_4(OH)_{12}(H_2O)_{138}$

Crystal Data: Tetragonal. *Point Group*: 4/*m* 2/*m* 2/*m*. As aggregates of equant crystals to 0.2 mm.

Physical Properties: *Cleavage*: None. *Fracture*: Uneven. *Tenacity*: Brittle. Hardness = ~2 D(meas.) = n.d. D(calc.) = 2.525

Optical Properties: Transparent. *Color*: Golden-yellow. S*treak*: Pale yellow. *Luster*: Vitreous. *Optical Class*: Uniaxial (neutral). ω = 1.537 ε = 1.537 Very weakly anisotropic (~isotropic).

Cell Data: Space Group: $I4_1/acd$. a = 35.142(2) c = 47.974(3) Z = 8 Proposed to be the most structurally complex mineral known with 12,684.86 information bits per unit cell.

X-ray Powder Pattern: Plavno mine, Jáchymov district, western Bohemia, Czech Republic. 8.28 (100), 10.1 (74), 5.69 (36), 14.3 (31), 6.03 (30), 4.774 (29), 6.61 (24)

Chemistry:

	(1)	(2)
MgO	2.75	2.79
CaO	3.73	3.88
MnO	0.21	
UO_3	59.41	59.43
CO_2	11.43	11.43
H_2O	22.47	22.46
Total	100.00	99.99

(1) Plavno mine, Jáchymov district, western Bohemia, Czech Republic; U, Mg, Mn, and Ca determined by high-resolution, inductively-coupled-plasma, mass spectrometry as a ratio relative to uranium, supplemented by Raman and FTIR spectroscopy. Formula calculated for 24 U, 292 O, and 30 CO_3 pfu (from crystal structure constraints) with charge balanced by adding hydrogen; corresponds to $(Mg_{7.89}Ca_{7.69}Mn_{0.34})_{\Sigma=15.92}(UO_2)_{24}(CO_3)_{30}O_4(OH)_{11.84}(H_2O)_{138.16}$.
(2) $Mg_8Ca_8(UO_2)_{24}(CO_3)_{30}O_4(OH)_{12}(H_2O)_{138}$.

Occurrence: A secondary mineral formed by postmining oxidation of primary uraninite in a wet environment on a damp wall in an abandoned underground mine.

Association: Liebigite, metazellerite, gypsum, uraninite.

Distribution: At the Plavno mine, Vladimir shaft, second level, Jáchymov ore district, western Bohemia, Czech Republic.

Name: Honors Rodney C. Ewing (b. 1946) mineralogist and material scientist focused on the properties of nuclear materials at Stanford University, California, USA.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (65686).

References: (1) Olds, T.A., J. Plášil, A.R. Kampf, A. Simonetti, L.R. Sadergaski, Yu-S. Chen, and P.C. Burns (2017) Ewingite: Earth's most complex mineral. Geology, 45(11), 1007-1010.
(2) (2020) Amer. Mineral., 105(8), 1278-1279 (abs. ref. 1).