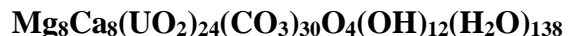


**Ewingite**

**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. *Streak:* Pale yellow. *Luster:* Vitreous.  
*Optical Class:* Uniaxial (neutral).  $\omega = 1.537$   $\varepsilon = 1.537$  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)

<b>Chemistry:</b>	(1)	(2)
MgO	2.75	2.79
CaO	3.73	3.88
MnO	0.21	
UO <sub>3</sub>	59.41	59.43
CO <sub>2</sub>	11.43	11.43
<u>H<sub>2</sub>O</u>	<u>22.47</u>	<u>22.46</u>
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<sub>3</sub> pfu (from crystal structure constraints) with charge balanced by adding hydrogen; corresponds to  $(\text{Mg}_{7.89}\text{Ca}_{7.69}\text{Mn}_{0.34})_{\Sigma=15.92}(\text{UO}_2)_{24}(\text{CO}_3)_{30}\text{O}_4(\text{OH})_{11.84}(\text{H}_2\text{O})_{138.16}$ .

(2)  $\text{Mg}_8\text{Ca}_8(\text{UO}_2)_{24}(\text{CO}_3)_{30}\text{O}_4(\text{OH})_{12}(\text{H}_2\text{O})_{138}$ .

**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).