Zellerite $Ca(UO_2)(CO_3)_2 \cdot 5H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$ or $mm2$. As fine hairlike fibers, to 2 mm, in roughly radial aggregates, veinlets, and incrustations.

Physical Properties: *Cleavage:* One, ‖ elongation, possible. Hardness = ∼2
D(meas.) = 3.25(1) D(calc.) = 3.242 Radioactive; fluoresces patchy green under SW and LW UV.

Optical Properties: Transparent. *Color:* Pale lemon-yellow; very pale yellow in transmitted light.
Optical Class: Biaxial (+). *Pleochroism:* $X = Y$ = colorless; Z = pale yellow. *Orientation:* $Z = c$. *Dispersion:* $r < v$. $\alpha = 1.536(5)$ $\beta = 1.559(5)$ $\gamma = 1.697(5)$ 2V(meas.) = 25°–30°

Cell Data: *Space Group:* $Pmmm$ or $Pmn2_1$. $a = 11.220(15)$ $b = 19.252(16)$ $c = 4.933(16)$ Z = 4

X-ray Powder Pattern: Lucky Mc mine, Wyoming, USA.
9.66 (100), 4.848 (50), 5.591 (35), 3.651 (35), 4.407 (25), 7.33 (18), 2.947 (13)

Chemistry:

	(1)	(2)
CO_2	16.9	16.92
UO_3	53.9	54.98
CaO	10.3	10.78
H_2O^+	12.3	
H_2O^-	6.6	
H_2O		17.32
Total	[100.0]	100.00

(1) Lucky Mc mine, Wyoming, USA; CO_2 and H_2O by CHN analyzer; recalculated to 100.0% after deduction of R_2O_3 1.0%, Na_2O 0.4%, K_2O 0.2%, SiO_2 + insoluble 0.5% from an original total of 100.2%; corresponds to $Ca_{1.00}(UO_2)_{1.03}(CO_3)_{2.09} \cdot 3.72H_2O$. (2) $Ca(UO_2)(CO_3)_2 \cdot 5H_2O$.

Occurrence: A rare weathering product of uranium ores, formed at low pH in the presence of oxidizing pyrite.

Association: Metazellerite, gypsum, "limonite", iron sulfides, schoepite, meta-autunite, uranophane, "opal".

Distribution: In the USA, from the Lucky Mc mine, Wind River Basin, Fremont Co., and the Pat No. 8 mine, Powder River Basin, Converse Co., Wyoming; in the White Canyon No. 1 mine, Frey Point, San Juan Co., Utah; at the Alta mine, Ambrosia Lake district, and Westwater Canyon, McKinley Co., New Mexico. In the Hatrurim Formation, Israel. From Jáchymov (Joachimsthal), Czech Republic.

Name: To honor Howard Davis Zeller (1922–), geologist with the U.S. Geological Survey, who discovered the mineral.

Type Material: National Museum of Natural History, Washington, D.C., USA, 112827.

References: (1) Coleman, R.G., D.R. Ross, and R. Meyrowitz (1966) Zellerite and metazellerite, new uranyl carbonates. Amer. Mineral., 51, 1567–1578.