Xocolatlite $Ca_2Mn^{4+}{}_2Te^{6+}{}_2O_{12}\cdot H_2O$

Crystal Data: Monoclinic. *Point Group*: 2, 2/*m*, or *m*. As layered crusts of micaceous plates to ~40 μm.

Physical Properties: *Cleavage*: Perfect micaceous. *Fracture*: Conchoidal. *Tenacity*: Brittle. Hardness = 2-3 D(meas.) = ~4.04 (porous material with trapped air) D(calc.) = 4.97

Optical Properties: Transparent. *Color*: Chocolate-brown. *Streak*: Copper-brown.
Luster: Vitreous.
Optical Class: Biaxial. $n > 2.0$ Non-pleochroic.

Cell Data: *Space Group*: *P*2, *P*2/*m*, or *Pm*. $a = 10.757(3)$ $b = 4.928(3)$ $c = 8.942(2)$ $\beta = 102.39(3)°$ $Z = 2$

X-ray Powder Pattern: Bambolla mine, Moctezuma, Sonora, Mexico.
3.267 (100), 2.52 (71), 4.361 (51), 1.762 (39), 4.924 (34), 2.244 (32), 1.455 (24)

Chemistry:

	(1)	(2)	(3)	(4)
TeO_3	48.60	51.31	51.93	53.60
SeO_3	0.03	0.04	0.03	
SO_3	0.11	0.24	0.09	
SiO_2	1.10	0.04	<0.05	
CaO	9.74	9.25	11.65	17.12
Al_2O_3	0.28	1.99	1.05	
MnO_2	28.15	22.01	28.30	26.54
Fe_2O_3	0.04	6.93	0.32	
ZnO	2.16	0.83	1.30	
CdO	0.07	0.12	0.09	
PbO	3.62	1.61	2.75	
Bi_2O_3	0.08	0.08	0.05	
H_2O	[2.48]	[2.58]	[2.66]	2.75
Total	96.46	97.03	100.22	100.00

(1-3) Bambolla mine, Moctezuma, Sonora, Mexico; average electron microprobe analyses supplemented by IR, Raman and XANES spectroscopy, H_2O calculated; for analysis (1) corresponds to $Ca_{1.262}Zn_{0.193}Pb_{0.118}Al_{0.040}Fe_{0.004}Cd_{0.004}Bi_{0.002}Mn_{2.353}Te_{2.011}S_{0.010}Se_{0.002}O_{12.421}\cdot H_2O$.
(4) $Ca_2Mn^{4+}{}_2Te^{6+}{}_2O_{12}\cdot H_2O$.

Polymorphism & Series: A possible series with kuranakhite.

Occurrence: From the weathering of an epithermal quartz-tellurium-gold vein system.

Association: Quartz, barite, jarosite, emmonsite, schmitterite, eztlite.

Distribution: From the Bambolla mine, Moctezuma, Sonora, Mexico.

Name: After the word *xocolatl* used by the Aztecs for a sacred beverage, known in English as chocolate, made by mixing cocoa, water, vanilla, pepper, and chili. The name alludes to the mineral's chocolate-brown color and Mexican provenance.

Type Material: Musée Cantonal de Géologie, Lausanne, Switzerland (MGL90740).

References: (1) Grundler, P.V., J. Brugger, N. Meisser, S. Ansermet, S. Borg, B. Etschmann, D. Testemale, and T. Bolin (2008) Xocolatlite, $Ca_2Mn^{4+}{}_2Te_2O_{12}\cdot H_2O$, a new tellurate related to kuranakhite: Description and measurement of Te oxidation state by XANES spectroscopy. Amer. Mineral., 93, 1911-1920.