Hansesmarkite $Ca_2Mn_2Nb_6O_{19}\cdot 20H_2O$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. Rare as tabular crystals to 0.3 mm and elongated along [100]. Typically, in patches to 6 mm of fine-grained material on gonnardite. Crystals display {100}, {010}, {011}, {01$\bar{1}$ }, {10$\bar{1}$ }, {1$\bar{1}$ 1}, {1$\bar{1}$ 0}, {12$\bar{2}$ 2}, {12$\bar{3}$ } and {210}.

Physical Properties: *Cleavage*: Good on {011} and {01$\bar{1}$ }. *Tenacity*: Brittle. *Fracture*: Curved. Hardness = 2-2.5 [by analogy to peterandresenite] D(meas.) = n.d. D(calc.) = 2.74

Optical Properties: Transparent. *Color*: Yellow. *Streak*: Pale yellow. *Luster*: Vitreous to resinous. *Optical Class*: Biaxial (+). α = 1.683(2) β = 1.698(2) γ = 1.745(3) 2V(meas.) = 60.7(6)° 2V(calc.) = 60.3° *Pleochroism*: *X* = almost colorless, *Y* = pale yellow, *Z* = orange-yellow. *Absorption*: *X* < *Y* << *Z*. *Dispersion*: Moderate, *r* > *v*. *Orientation*: *X* ^ *c* = 20°, *Y* ^ *b* = 16°, *Z* ^ *a* = 5°.

Cell Data: *Space Group*: $P\bar{1}$. a = 9.081(4) b = 9.982(8) c = 10.60(1) α = 111.07(8)° β = 101.15(6)° γ = 99.39(5)° Z = 1

X-ray Powder Pattern: Tvedalen, Larvik, Vestfold, Norway.
8.610 (100), 9.282 (36), 3.257 (30), 3.058 (18), 2.715 (17), 7.108 (14), 5.412 (12)

Chemistry:	(1)	(2)
Nb_2O_5	64	56.48
MnO	10.2	10.05
CaO	8.6	7.94
FeO	0.6	
Na_2O	0.04	
K_2O	0.02	
H_2O	[28.94]	25.52
Total	112.60	99.99

(1) Tvedalen, Larvik, Vestfold, Norway; average of 5 electron microprobe analyses supplemented by Raman spectroscopy, H_2O from structure analysis; corresponds to $(Ca_{1.93}Na_{0.02}K_{0.01})_{\Sigma=1.96}(Mn_{1.79}Fe_{0.11})_{\Sigma=1.90}Nb_6O_{18.84}\cdot 20H_2O$. (2) $Ca_2Mn_2Nb_6O_{19}\cdot 20H_2O$.

Occurrence: On fracture surfaces in a hydrothermally altered syenite pegmatite dike.

Association: Analcime, arsenopyrite, behoite, bertrandite, calcite, chiavennite, chlorite, epididymite, fluorapophyllite-(K), fluorite, galena, gonnardite, hambergite, linarite-(OH), molybdenite, natrolite, neotocite, peterandresenite.

Distribution: Found at level 4 of the AS Granit larvikite quarry, Tvedalen, Larvik, Vestfold, Norway.

Name: Honors Hans Morten Thrane Esmark (1801-1882), a Norwegian priest from the town of Brevik, an enthusiastic mineral collector in the pegmatites of the Larvik Plutonic Complex who discovered several new mineral species including aegirine, leucophanite, and thorite.

Type Material: Natural History Museum, University of Oslo, Norway (43584-43586) and the Natural History Museum of Los Angeles County, Los Angeles, California, USA (64165).

References: (1) Friis, H., M.T. Weller, and A.R. Kampf (2017) Hansesmarkite, $Ca_2Mn_2Nb_6O_{19}\cdot 20H_2O$, a new hexaniobate from a syenite pegmatite in the Larvik Plutonic Complex, southern Norway. Mineral. Mag., 81(3), 543-554. (2) (2018) Amer. Mineral., 103, 2527 (abs. ref. 1).