Haineaultite $(Na,Ca)_5Ca(Ti,Nb)_5(Si,S)_{12}O_{34}(OH,F)_8 \cdot 5H_2O$

Crystal Data: Orthorhombic. *Point Group:* 222. As fan-like aggregates of tabular to bladed crystals or as isolated prismatic crystals, elongate on [001] to 6 mm, variably showing {100}, {010}, {001}, and {011}.

Physical Properties: *Cleavage:* Distinct to good on {100}, {010}, and {001}. *Tenacity:* Brittle. *Fracture:* Blocky to splintery. Hardness = 3-4 D(meas.) = n.d. D(calc.) = 2.28

Optical Properties: Transparent to translucent. *Color:* Pale orange, lemon-yellow, less commonly tan or off-white. *Streak:* White. *Luster:* Vitreous.
Optical Class: Biaxial (+). $\alpha = 1.599(1)$ $\beta = 1.610(1)$ $\gamma = 1.696(1)$ 2V(meas) = 38(1)° 2V(calc) = 41(1)° *Dispersion: None*. *Orientation: X = b*; *Y = c*; *Z = a*. *Pleochroism*: *None*.

Cell Data: *Space Group: C*222. $a = 7.204(4)$ $b = 23.155(5)$ $c = 6.953(2)$ $Z = 1$

X-ray Powder Pattern: Poudrette quarry, Mont Saint-Hilaire, Quebec, Canada.
11.564 (100), 6.932 (90), 3.052 (75), 2.977 (70), 5.258 (40), 4.446 (40), 2.582 (40)

Chemistry:

	(1)		(1)
Na_2O	4.70	TiO_2	18.86
K_2O	2.09	ZrO_2	0.31
MgO	0.07	Nb_2O_5	5.56
CaO	9.99	SO_3	2.60
MnO	0.25	F	0.17
FeO	0.49	H_2O $_{(calc.)}$	10.11
SiO_2	42.70	$-O = F_2$	0.07
		Total	97.83

(1) Poudrette quarry, Mont Saint-Hilaire, Quebec, Canada; average of 16 electron microprobe analyses, H_2O and OH^- confirmed by structure analysis and IR, corresponding to $(Na_{2.41}Ca_{1.83}K_{0.71})_{\Sigma=4.95}Ca(Ti_{3.76}Nb_{0.67}Fe_{0.11}Mn_{0.06}Zr_{0.04}Mg_{0.03})_{\Sigma=4.67}(Si_{11.30}S_{0.52})_{\Sigma=11.82}O_{34}(OH_{7.86}F_{0.14})_{\Sigma=8.00} \cdot 5H_2O$.

Mineral Group: Labuntsovite group.

Occurrence: A late-stage mineral in altered marble zenoliths and breccia in a complex peralkaline intrusion (nepheline and sodalite syenties).

Association: Quartz, calcite, sodic amphibole, pectolite, fluorapophyllite, vesuvianite, tainiolite, albite, fluorite, microcline, aegirine, and 17 less-abundant minerals.

Distribution: From the Poudrette quarry, Mont Saint-Hilaire, Rouville County, Quebec, Canada.

Name: Honors Gilles Haineault (b. 1946) of St-Mathieu de Beloeil, Quebec, a collector and dealer of minerals from Mont Saint-Hilaire.

Type Material: Canadian Museum of Nature, Ottawa; 81547.

References: (1) McDonald, A.M., and G.Y. Chao (2004) Haineaultite, a new hydrated sodium calcium titanosilicate from Mont Saint-Hilaire, Quebec: description, structure determination and genetic implications. Can. Mineral., 42, 769–780. (2) (2005) Amer. Mineral., 90, 271 (abs. ref. 1).