Nagashimalite $Ba_4(V^{3+},Ti)_4(B_2Si_8O_{27})Cl(O,OH)_2$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals tabular on {001}, elongated along [010], to 15 mm, forming subparallel aggregates; striated on {001} ∥ [010].

Physical Properties: Hardness = ∼6 VHN = 606–681 (100 g load). D(meas.) = 4.08 D(calc.) = 4.14

Optical Properties: Opaque to transparent. *Color:* Greenish black. *Streak:* Green. *Luster:* Submetallic to vitreous.
Optical Class: Biaxial (+). *Pleochroism:* Strong; X = greenish yellow; Y = green; Z = greenish brown. *Orientation:* $X = a$; $Y = c$; $Z = b$. *Dispersion:* $r > v$, strong. *Absorption:* $Z > Y > X$. $\alpha = 1.750$ $\beta = 1.753$ $\gamma = 1.780$ 2V(meas.) = ∼30°

Cell Data: *Space Group: Pmmn.* a = 13.937(3) b = 12.122((3) c = 7.116(2) Z = 2

X-ray Powder Pattern: Mogurazawa mine, Japan.
3.020 (100), 3.030 (60), 2.592 (28), 3.854 (25), 2.791 (20), 3.319 (15), 3.273 (15)

Chemistry:

	(1)
SiO_2	32.37
TiO_2	2.75
B_2O_3	4.0
V_2O_3	16.65
MnO	0.48
BaO	41.36
Cl	1.73
H_2O	[0.77]
$-O = Cl_2$	0.39
Total	[99.72]

(1) Mogurazawa mine, Japan; by electron microprobe, B by wet chemical analysis, H_2O calculated to give Cl+(OH)=2; corresponds to $Ba_{4.00}(V^{3+}_{3.30}Ti_{0.51}Mn_{0.10})_{\Sigma=3.91}B_{1.71}Si_8O_{27.64}Cl_{0.72}(OH)_{1.28}$.

Occurrence: In fissures cutting massive rhodonite ore in a bedded manganese deposit.

Association: Rhodochrosite, rhodonite, barite, barian roscoelite, alabandite, digenite, bornite, tetrahedrite.

Distribution: In the Mogurazawa mine, Kiryu, Gumma Prefecture, Japan.

Name: For pioneer Japanese amateur mineralogist, Otokichi Nagashima (1890–1969).

Type Material: National Science Museum, Tokyo, Japan, M21727; National Museum of Natural History, Washington, D.C., USA, 142987.

References: (1) Matsubara, S. and A. Kato (1980) Nagashimalite, $Ba_4(V^{3+},Ti)_4[(O,OH)_2|Cl|Si_8B_2O_{27}]$, a new mineral from the Mogurazawa mine, Gumma Prefecture, Japan. Mineral. J. (Japan), 10, 122–130. (2) Matsubara, S. (1980) The crystal structure of nagashimalite, $Ba_4(V^{3+},Ti)_4[(O,OH)_2|Cl|Si_8B_2O_{27}]$. Mineral. J. (Japan), 10, 131–142. (3) (1981) Amer. Mineral., 66, 638 (abs. refs. 1 and 2).