

Heyerdahlite**Na₃Mn₇Ti₂(Si₄O₁₂)₂O₂(OH)₄F(H₂O)₂**

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. As radiating fans, to 2 mm, of elongated lath-like crystals to ~1 mm. *Twining:* By 180° rotation around [120].

Physical Properties: *Cleavage:* Perfect on {001}. *Fracture:* Hackly. *Tenacity:* Brittle. Hardness = 3 D(meas.) = n.d. D(calc.) = 3.245

Optical Properties: Transparent. *Color:* Colorless to pale brown. *Streak:* Pale brown. *Luster:* Vitreous.

Optical Class: Biaxial (+). $\alpha = 1.694(2)$ $\beta = 1.710(5)$ $\gamma = 1.730(5)$ $2V(\text{meas.}) = 80(4)^\circ$ $2V(\text{calc.}) = 84.5^\circ$ *Pleochroism:* X = yellowish brown, Y = brownish yellow, Z = pale yellow. *Absorption:* X > Y > Z. *Dispersion:* Strong, r > v. *Orientation:* X \wedge a = 89.9°, X \wedge b = 23.9°, X \wedge c = 95.1°; Y \wedge a = 86.5°, Y \wedge b = 110.1°, Y \wedge c = 9.8°; Z \wedge a = 3.5°, Z \wedge b = 102.0°, Z \wedge c = 98.3°.

Cell Data: Space Group: $P\bar{1}$. a = 5.392(2) b = 11.968(4) c = 11.868(4) $\alpha = 112.743(8)^\circ$ $\beta = 94.816(7)^\circ$ $\gamma = 103.037(8)^\circ$ Z = 1

X-ray Powder Pattern: Near Lågendalen, Hedrum, Vestfold County, Norway. 10.745 (100), 2.594 (65), 2.791 (55), 3.582 (43), 2.663 (42), 2.496 (33), 2.686 (29)

Chemistry:	(1)		(1)
Nb ₂ O ₅	1.67	MgO	0.30
ZrO ₂	0.53	Cs ₂ O	0.12
TiO ₂	10.37	Rb ₂ O	0.82
SiO ₂	35.17	K ₂ O	2.33
PbO	0.22	Na ₂ O	5.70
ZnO	1.34	F	1.49
FeO	0.14	H ₂ O	[4.12]
MnO	32.50	<u>-O = F₂</u>	<u>0.63</u>
CaO	0.03	Total	96.22

(1) Near Lågendalen, Hedrum, Vestfold County, Norway; average of 8 electron microprobe analyses supplemented by FTIR spectroscopy, H₂O calculated from structure; corresponds to (Na_{1.18}K_{0.68}Rb_{0.12}Cs_{0.01}Pb_{0.01}) $\Sigma=2.00$ Na_{1.00}(Mn_{6.29}Zn_{0.23}Mg_{0.07}Zr_{0.04}Fe²⁺_{0.02}Ca_{0.01}Na_{0.34}) $\Sigma=7.01$ (Ti_{1.78}Nb_{0.17}Mg_{0.03}Zr_{0.02}) $\Sigma=2.00$ (Si_{8.03}O₂₄)O₂[(OH)_{3.92}F_{0.08}] $\Sigma=4.00$ F_{1.00}[(H₂O)_{1.18}□_{0.82}] $\Sigma=2.00$.

Mineral Group: Astrophyllite supergroup, kupletskite group.

Occurrence: A late-stage hydrothermal mineral in nepheline-syenite pegmatite hosted by foyaite.

Association: Albite, aegirine, hastingsite/magnesio-hastingsite, kupletskite, lorenzenite, pyrophanite.

Distribution: From a road cut ~200 m SE of the Bratthagen farm, Lågendalen, Hedrum, Vestfold County, Norway.

Name: Honors the Norwegian explorer Thor Heyerdahl (1914-2002), who was born and raised in the city of Larvik, which is within the Larvik Plutonic complex - where the first specimens were collected.

Type Material: Royal Ontario Museum, Toronto, Ontario, Canada (M57516).

References: (1) Sokolova, E., M.C. Day, F.C. Hawthorne, and R. Kristiansen (2018) Heyerdahlite, Na₃Mn₇Ti₂(Si₄O₁₂)₂O₂(OH)₄F(H₂O)₂, a new mineral of the astrophyllite supergroup from the Larvik Plutonic complex, Norway: Description and crystal structure. *Mineral. Mag.*, 82(2), 243-255.

(2) (2019) *Amer. Mineral.*, 104(4), 626-627 (abs. ref. 1). (3) Sokolova, E., F. Cámara, F.C. Hawthorne, and M.E. Ciriotti, (2017) The astrophyllite supergroup: nomenclature and classification. *Mineral. Mag.*, 81, 143-153.