

Grenmarite

Crystal Data: Monoclinic. *Point Group:* 2/m. As semi-parallel aggregates of elongated, flattened crystals, to 1 cm. Crystals striated parallel to [010], slightly curved and dominated by {201} and {20 $\bar{3}$ }.

Physical Properties: *Cleavage:* Good on {001}. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = 4.5 D(meas.) = 3.49(1) D(calc.) = 3.568

Optical Properties: Transparent to translucent. *Color:* Yellow brown, alters to brown. *Streak:* Pale yellowish-brown. *Luster:* Vitreous. *Optical Class:* Biaxial (+). $\alpha = 1.694$ $\beta = \text{n.d.}$ $\gamma = 1.735$ *Orientation:* $X = b$, $Z \wedge a = 42^\circ$. *Pleochroism:* $X = \text{colorless}$, $Z = \text{light brown}$.

Cell Data: Space Group: $P2/c$. $a = 5.608(1)$ $b = 7.139(1)$ $c = 18.575(5)$ $\beta = 102.60(2)^\circ$ $Z = 2$

X-ray Powder Pattern: Vesle Arøya, Langesundsfjord district, Vestfold, Norway. 2.898 (100), 3.027 (68), 2.613 (26), 2.459 (24), 1.853 (24), 3.949 (15), 1.786 (14), 1.650 (14)

Chemistry:	(1)		(1)
SiO ₂	29.85	Y ₂ O ₃	0.22
TiO ₂	4.51	La ₂ O ₃	0.00
CaO	1.84	Ce ₂ O ₃	0.01
MnO	8.25	ZrO ₂	31.63
FeO	2.01	Nb ₂ O ₅	0.06
Na ₂ O	15.43	F	5.24
		<u>-O=F</u>	<u>2.21</u>
		Total	96.84

(1) Vesle Arøya, Langesundsfjord district, Vestfold, Norway; average of 15 electron microprobe analyses, absence of H₂O and OH⁻ confirmed by IR spectroscopy and structure analysis; corresponds to $(Zr_{1.52}Mn_{0.46}Y_{0.02})_{\Sigma=2.00}(Zr_{0.55}Ti_{0.45})_{\Sigma=1.00}(Mn_{0.48}Na_{0.29}Fe_{0.23})_{\Sigma=1.00}(Na_{3.72}Ca_{0.26})_{\Sigma=3.98}Si_4O_{15.40}F_{2.22}$.

Mineral Group: Götzenite-seidozerite-rosenbuschite group.

Polymorphism & Series: Forms a series with seidozerite.

Occurrence: An early crystallization product, embedded in microcline and fine-grained albite in an alkaline nepheline syenite pegmatite dike cutting larvikite.

Association: Microcline, aegirine, biotite, nepheline, albite, astrophyllite, låvenite, catapleite, leucophanite, pyrochlore, fluorite, and minor molybdenite, sphalerite, galena, löllingite.

Distribution: From a dike on the eastern side of the island of Vesle Arøya, Langesundsfjord district, Vestfold, Norway.

Name: For *Grenmar*, the Norse name of the Langesundsfjord.

Type Material: Natural History Museum, University of Pisa, Italy (2003-024) and at the Geological Museum, University of Oslo, Norway (33974).

References: (1) Bellezza, M., M. Franzini, A.O. Larsen, S. Merlino, and N. Perchiazzi, (2004) Grenmarite, a new member of the götzenite-seidozerite-rosenbuschite group from the Langesundsfjord district, Norway: definition and crystal structure. *Eur. J. Mineral.*, 16, 971-978. (2) (2005) *Amer. Mineral.*, 90, 1228 (abs. ref. 1).