

Västmanlandite-(Ce)**(Ce,La)₃CaAl₂Mg₂[Si₂O₇][SiO₄]₃F(OH)₂**

Crystal Data: Monoclinic. *Point Group:* 2/m. As irregular grains to 3mm.

Physical Properties: *Cleavage:* Good on {001}. *Fracture:* Uneven to conchoidal. *Tenacity:* n.d. Hardness = 6 D(meas.) = n.d. D(calc.) = 4.51(2)

Optical Properties: Translucent. *Color:* Black to dark brown. *Streak:* Yellowish gray.

Luster: Vitreous.

Optical Class: Biaxial (+). $\alpha = 1.781(4)$ $\beta(\text{calc}) = 1.792$ $\gamma = 1.810(4)$ $2V = 75(5)^\circ$

Dispersion: $r > v$, strong. *Pleochroism:* Strong, X = pale yellow, Y = reddish brown, Z = dark brown. *Absorption:* $Z \sim Y > X$ (orientation unknown).

Cell Data: *Space Group:* P2₁/m. $a = 8.939(1)$ $b = 5.706(1)$ $c = 15.855(2)$ $\beta = 94.58(1)^\circ$

X-ray Powder Pattern: Malmkärra iron deposit, Västmanland county, south-central Sweden. 2.9831 (100), 3.503 (20), 2.6250 (19), 15.81 (16), 2.1874 (15), 2.6852 (13), 2.6784 (11)

Chemistry:

	(1)		(1)
La ₂ O ₃	13.65	CaO	4.65
Ce ₂ O ₃	23.90	FeO	3.56
Pr ₂ O ₃	2.07	MgO	5.51
Nd ₂ O ₃	6.28	Al ₂ O ₃	8.58
Sm ₂ O ₃	0.42	SiO ₂	26.61
Gd ₂ O ₃	0.15	P ₂ O ₅	0.05
Dy ₂ O ₃	0.01	TiO ₂	0.04
Ho ₂ O ₃	0.02	F	1.06
Er ₂ O ₃	0.00	[H ₂ O]	1.6
Yb ₂ O ₃	0.03	- O = F	0.45
Y ₂ O ₃	0.18	Total	96.31

(1) Malmkärra iron deposit, Västmanland county, south-central Sweden; average of 3 electron microprobe analyses, H₂O estimated as 2OH per formula unit, Fe²⁺/Fe³⁺ by Mössbauer spectroscopy, OH⁻ confirmed by IR spectroscopy; corresponding to (Ce_{1.62}La_{0.93}Nd_{0.42}Pr_{0.14}Sm_{0.03}Y_{0.02}Gd_{0.01})_{Σ=3.17} Ca_{0.92}Al_{1.88}(Mg_{1.52}Fe³⁺_{0.37}Fe²⁺_{0.18})_{Σ=2.07}(Si_{4.94}P_{0.01})_{Σ=4.95}O_{0.19}(F_{0.62}O_{0.38})_{Σ=1.00}(OH)₂.

Polymorphism and Series: Forms a solid solution series with an Fe analog.

Occurrence: In disseminated magnetite-amphibole calc-silicate replacements in marble.

Association: Fluorbritholite-(Ce), tremolite, dolomite, magnetite, and minor arsenopyrite, bastnäsite-(Ce), bismuthinite, cerite-(Ce), chalcopyrite, dollaseite-(Ce), ferriallanite, gadolinite-(Ce), molybdenite, pyrite, talc, zircon.

Distribution: From the Malmkärra iron deposit (also the Bastnäs and Östanmossa deposits), Norberg district, Västmanland county, Bergslagen mining region, south-central Sweden.

Name: For the county in Norway in which the first specimens were collected.

Type Material: Swedish Museum of Natural History, Stockholm, Sweden (01+0081).

References: (1) Holtstam, D., U. Kolitsch, and U.B. Andersson (2005) Västmanlandite-(Ce) - a new lanthanide- and F-bearing sorosilicate mineral from Västmanland, Sweden: description, crystal structure, and relation to gatelite-(Ce). Eur. J. Mineral., 17, 129-141. (2) (2005) Amer. Mineral., 90, 1948-1949 (abs. ref. 1).