

Daqingshanite-(Ce) (Sr, Ca, Ba)₃(Ce, La)(PO₄)(CO₃)_{3-x}(OH, F)_x

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Crystal Data: Hexagonal. *Point Group:* 3m (probable). As subhedral to rounded platy crystals, may be crudely rhombohedral, to 3 mm, in aggregates. *Twinning:* Complex polysynthetic twinning observed in some material.

Physical Properties: *Cleavage:* Perfect on {10 $\bar{1}$ 1}. *Fracture:* Conchoidal. Hardness = n.d. VHN = 335 (20 g load). D(meas.) = 3.81 D(calc.) = 3.71

Optical Properties: Semitransparent. *Color:* Pale yellow to nearly white; colorless in thin section. *Streak:* White. *Luster:* Vitreous to greasy. *Optical Class:* Uniaxial (-). $\omega = 1.708$ $\epsilon = 1.609$

Cell Data: *Space Group:* $R\bar{3}m$, $R\bar{3}m$, or $R32$. $a = 10.058\text{--}10.073$ $c = 9.225\text{--}9.234$ $Z = 3$

X-ray Powder Pattern: Bayan Obo deposit, China.
3.16 (10), 2.52 (7), 3.95 (6), 2.040 (6), 1.941 (6), 2.110 (5), 1.895 (4)

Chemistry: (1)		(2)	(1)		(2)	(1)		(2)
P ₂ O ₅	11.73	10.50	Fe ₂ O ₃	0.21		K ₂ O	0.03	
CO ₂	16.19	n.d.	MnO	0.02		F	0.80	0.29
ThO ₂	0.04	< 0.22	MgO	0.72	< 0.12	Cl		0.10
Al ₂ O ₃	0.18	< 0.12	CaO	6.17	0.94	H ₂ O ⁺	0.68	n.d.
La ₂ O ₃	7.88	10.22	SrO	26.10	41.82	-O = F ₂	0.34	
Ce ₂ O ₃	10.16	12.24	BaO	15.98	4.57	Total	[99.376]	
RE ₂ O ₃	2.696	< 3.36	Na ₂ O	0.13	< 0.16			

(1) Bayan Obo deposit, China; CO₂ and H₂O by gas chromatography, original total given as 99.20%; RE₂O₃ = Pr₆O₁₁ 0.70%, Nd₂O₃ 1.59%, Sm₂O₃ 0.106%, Eu₂O₃ 0.02%, Gd₂O₃ 0.12%, Tb₄O₇ 0.05%, Dy₂O₃ 0.03%, Ho₂O₃ 0.03%, Er₂O₃ 0.01%, Tm₂O₃ 0.01%, Yb₂O₃ 0.02%, Lu₂O₃ 0.01%; corresponds to (Sr_{1.52}Ca_{0.67}Ba_{0.63}Mg_{0.11}Na_{0.03}) $\Sigma=2.96$ (Ce_{0.37}La_{0.29}RE_{0.10}Al_{0.02}Fe_{0.02}³⁺) $\Sigma=0.80$ (PO₄)_{1.00}(CO₃)_{2.23}[(OH)_{0.46}F_{0.26}] $\Sigma=0.72$. (2) Nkombwa Hill, Zambia; by electron microprobe, average of ten partial analyses; RE₂O₃ = Pr₂O₃ 0.83%, Nd₂O₃ 1.71%, Sm₂O₃ < 0.42%, Gd₂O₃ < 0.40%; corresponds to (Sr_{2.69}Ba_{0.20}Ca_{0.11}) $\Sigma=3.00$ (Ce_{0.50}La_{0.42}RE_{0.10}) $\Sigma=1.02$ (PO₄)_{0.99}(CO₃)_{3-x}[(OH), F]_x.

Occurrence: In rare-earth-bearing carbonatite-derived biotite dolomite at the footwall of an iron orebody (Bayan Obo deposit, China); in an intrusive alkalic gabbro-syenite complex (Mont Saint-Hilaire, Canada); in altered magnesiocarbonatite (Nkombwa Hill, Zambia).

Association: Benstonite, huntite, strontianite, pyrite, phlogopite, monazite (Bayan Obo deposit, China); albite, ancylite, pyrite, anatase, chlorite (Mont Saint-Hilaire, Canada); dolomite, monazite, isokite, apatite, strontianite, quartz (Nkombwa Hill, Zambia).

Distribution: In the western Bayan Obo Fe-Nb-RE deposit, 130 km north of Baotou, Inner Mongolia, China. From Mont Saint-Hilaire, Quebec, Canada. At the Nkombwa Hill carbonatite, Zambia.

Name: For Mt. Daqingshan, near the Bayan Obo deposit, China.

Type Material: n.d.

References: (1) Ren Yingchen, Ximen Lulu, and Peng Zhizhong (1983) Daqingshanite – a new mineral recently discovered in China. *Geochemistry*, 2(2), 180–184 (in English). (2) (1984) *Amer. Mineral.*, 69, 811 (abs. ref. 1). (3) Horváth, L. and R.A. Gault (1990) The mineralogy of Mont Saint-Hilaire, Quebec. *Mineral. Record*, 21, 284–359, esp. 304. (4) Appleton, J.D., D.J. Bland, P.H. Nancarrow, M.T. Styles, S.H. Mambwe, and P. Zambezi (1992) The occurrence of daqingshanite-(Ce) in the Nkombwa Hill carbonatite, Zambia. *Mineral. Mag.*, 56, 419–422. (5) Hughes, J.M. and N. Yunxiang (1994) A high-precision crystal structure refinement of daqingshanite-(Ce) from the Nkombwa Hill carbonatite, Zambia. *Mineral. Mag.*, 58, 493–496.

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