

**Parisite-(Ce)****Ca(Ce, La)<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>F<sub>2</sub>**

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**Crystal Data:** Monoclinic, pseudohexagonal. *Point Group:* *m*. Steep doubly-terminated pyramidal crystals, many forms, but oscillatory and sceptered due to intergrowths || pseudo-{0001} with bastnäsite-(Ce), synchysite-(Ce), röntgenite-(Ce), cordylite, to 24 cm.

**Physical Properties:** *Cleavage:* On pseudo-{0001}, probably a parting. *Fracture:* Subconchoidal to splintery. *Tenacity:* Brittle. *Hardness* = 4.5 *D*(meas.) = 4.33 *D*(calc.) = [4.38] May exhibit dark red cathodoluminescence.

**Optical Properties:** Transparent to translucent. *Color:* Brownish yellow, orange, orange-brown, brown, wax-yellow, grayish yellow, lilac; colorless to yellow in transmitted light. *Streak:* Pale yellow. *Luster:* Vitreous to resinous, pearly on {0001} parting. *Optical Class:* Uniaxial (+). *Pleochroism:* Weak; *O* = pale yellow; *E* = golden yellow. *Absorption:* *O* < *E*.  $\omega = 1.671\text{--}1.676$   $\epsilon = 1.771\text{--}1.757$

**Cell Data:** *Space Group:* *Cc*. *a* = 12.3049 *b* = 7.1056 *c* = 28.2478  $\beta = 98.2416^\circ$   
*Z* = 12

**X-ray Powder Pattern:** Mont Saint-Hilaire, Canada; identical with parisite-(Nd). 3.565 (100), 2.838 (100), 2.060 (80), 1.938 (60), 1.882 (50), 1.658 (50), 14.03 (40)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
CO <sub>2</sub>	24.22	[24.58]	24.58	Eu <sub>2</sub> O <sub>3</sub>		0.20	
Y <sub>2</sub> O <sub>3</sub>	trace			Fe <sub>2</sub> O <sub>3</sub>	0.20		
La <sub>2</sub> O <sub>3</sub>		15.10	30.33	CaO	10.70	10.70	10.44
(La, Dy) <sub>2</sub> O <sub>3</sub>	29.74			Na <sub>2</sub> O	0.20		
Ce <sub>2</sub> O <sub>3</sub>	30.67	28.87	30.56	K <sub>2</sub> O	0.10		
Pr <sub>2</sub> O <sub>3</sub>		3.00		F	6.82	5.34	7.07
Nd <sub>2</sub> O <sub>3</sub>		11.65		–O = F <sub>2</sub>	2.87	2.24	2.98
Sm <sub>2</sub> O <sub>3</sub>		1.46		Total	99.78	[98.65]	100.00

(1) Muzo, Colombia. (2) Do.; by electron microprobe, average of four analyses, CO<sub>2</sub> from ideal formula; corresponds to Ca<sub>1.02</sub>(Ce<sub>0.94</sub>La<sub>0.50</sub>Nd<sub>0.37</sub>Pr<sub>0.10</sub>Sm<sub>0.05</sub>)<sub>Σ=1.96</sub>(CO<sub>3</sub>)<sub>3</sub>F<sub>1.51</sub>.

(3) Ca(Ce, La)<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>F<sub>2</sub> with Ce:La = 1:1.

**Polymorphism & Series:** 2M, pseudo-(3R, 4H, 6R, 8H, 10H, 14H, 16H, 18R, 25R, 30R, 36R, 42R, 48R) polytypes are known.

**Occurrence:** An accessory mineral in differentiated alkalic massifs, granite pegmatites, and RE-rich carbonatites.

**Association:** Bastnäsite, synchysite, cordylite, ancylite, calcite, fluorite, quartz.

**Distribution:** Many localities, most minor. Fine crystals from the Muzo district, Boyacá Province, Colombia. In the USA, in Montana, very large crystals at the Snowbird deposit and the nearby Cedar Log prospect, Mineral Co., and from Pyrites, 13 km east of Florence, Ravalli Co.; at Quincy, Norfolk Co., Massachusetts. From Mont Saint-Hilaire, Quebec, Canada. At Holmestrand, Vestfold, Norway. In the Trimouns talc deposit, six km northeast of Luzenac, Ariège, France. From Monterfano, Lombardy, Italy. Around Gallt y Wenallt, Gwynedd, Wales. In the Khibiny massif, Kola Peninsula, Russia. On Mt. Malosa, Zomba district, Malawi. At Ifasina, Torendrika, Madagascar. In the Lueshe carbonatite, 150 km north of Goma, Kivu Province, Congo (Zaire). At the Shirashi pegmatite, Kobe, Kyoto Prefecture, Japan. In the Bayan Obo Fe–Nb–RE deposit, 130 km north of Baotou, Inner Mongolia, China. At Nam Nam Xe, Vietnam.

**Name:** Honors J.J. Paris, Manager of the emerald mine at Muzo, Colombia.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 282–285. (2) Ni, Y., J.E. Post, and J.M. Hughes (2000) The crystal structure of parisite-(Ce), Ce<sub>2</sub>CaF<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>. *Amer. Mineral.*, 85, 251–258. (3) Cheang, K. (1977) Structure and polytypism in synchysite and parisite from Mont St. Hilaire, Quebec. MS thesis, Carleton University, Ottawa, Canada.

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