

Kukharenkoite-(Ce)**Ba₂Ce(CO₃)₃F**

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Crystal Data: Monoclinic, pseudorhombic. *Point Group:* 2/*m*. Crystals are platy or bladed prismatic, to 1 mm; typically in dendritic, reticulated, stellate, or fibrous aggregates; also fine granular massive. *Twinning:* Reticulated groups, not described as twins, are characteristic.

Physical Properties: *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = ~4.5 VHN = 250–320, 280 average (25 g load). D(meas.) = 4.71 D(calc.) = 4.62–4.73

Optical Properties: Transparent to translucent, may be opaque from inclusions.

Color: Colorless, white, silvery gray, pale pink, yellow, greenish yellow, reddish brown.

Streak: White. *Luster:* Vitreous to greasy.

Optical Class: Biaxial (–). *Orientation:* $Y = b$; $Z \wedge c = 26.5^\circ$. *Dispersion:* $r > v$, medium. $\alpha = 1.584\text{--}1.594$ $\beta = 1.710\text{--}1.730$ $\gamma = 1.715\text{--}1.730$ 2V(meas.) = 10°–20° 2V(calc.) = 18°–22°

Cell Data: *Space Group:* $P2_1/m$. $a = 13.360\text{--}13.418$ $b = 5.052\text{--}5.077$ $c = 6.681\text{--}6.714$ $\beta = 106.56^\circ\text{--}106.58^\circ$ $Z = 2$

X-ray Powder Pattern: Khibiny massif, Russia.

4.00 (100), 3.269 (100), 2.140 (40), 2.003 (40), 2.535 (20), 1.635 (10), 1.373 (10)

Chemistry:	(1)	(2)	(1)	(2)
CO ₂	[21.95]	21.10	CaO	0.39
Y ₂ O ₃	0.15		SrO	1.55
(La, Nd) ₂ O ₃		13.89	BaO	47.39
La ₂ O ₃	6.61		F	3.18
Ce ₂ O ₃	15.30	10.96	–O = F ₂	1.34
Pr ₂ O ₃	1.19		rem.	2.99
Nd ₂ O ₃	4.26			
MgO		0.85	Total	[100.63]
				100.03

(1) Khibiny massif, Russia; by electron microprobe, average of 12 analyses, F by microchemical methods, CO₃^{2–} calculated, corresponding to (Ba_{1.86}Sr_{0.09}Ca_{0.04})_{Σ=1.99}(Ce_{0.56}La_{0.24}Nd_{0.15}Pr_{0.04}Y_{0.01})_{Σ=1.00}(CO₃)_{3.00}F_{1.01}. (2) Bayan Obo deposit, China; remainder is ThO₂ 0.41%, Al₂O₃ 0.06%, Fe₂O₃ 2.52%; corresponds to (Ba_{1.56}Ca_{0.22}Mg_{0.11}Sr_{0.09})_{Σ=1.98}(Ce_{0.34}Ln_{0.46})_{Σ=0.80}(CO₃)₃F.

Occurrence: In syenitic alkalic massifs and carbonatites.

Association: Belovite-(Ce), ancylite-(Ce), cebaite-(Ce), cordylite-(Ce), synchysite-(Ce), mckelveyite-(Y), ewaldite, rinkite, zakharovite, nenadkevichite, yofortierite, lävenite, burbankite, calcite, barite, fluorapatite, fluorite.

Distribution: In Russia, from Tuliylukht Bay and the Kirov apatite mine, Mt. Kukisvumchorr, Khibiny massif, and at the Vuoriyarvi carbonatite complex, Kola Peninsula. In the Bayan Obo Fe–Nb–Re deposit, 130 km north of Baotou, Inner Mongolia, China. At Mont Saint-Hilaire, and from near Saint-Amable, Quebec, Canada.

Name: To honor Professor Aleksandr Aleksandrovich Kukharenko (1914–1993), Russian mineralogist, St. Petersburg University, St. Petersburg, Russia, for his extensive work on the carbonatites of the Kola Peninsula, Russia.

Type Material: Geology Museum, Kola Branch, Academy of Sciences, Apatity, 6097; Mineralogical Museum, St. Petersburg University, Russia, 1/18303; Canadian Museum of Nature, Ottawa, Canada, 81531–81533.

References: (1) Zaitsev, A.N., V.N. Yakovenchuk, G.Y. Chao, R.A. Gault, V.V. Subbotin, Y.A. Pakhomovskii, and A.N. Bogdanova (1996) Kukharenkoite-(Ce), Ba₂Ce(CO₃)₃F, a new mineral from Kola peninsula, Russia, and Québec, Canada. *Eur. J. Mineral.*, 8, 1327–1336. (2) (1997) *Amer. Mineral.*, 82, 1039 (abs. ref. 1). (3) Zhang Peishan and Tao Kejie (1981) Zhonghuacerite [= kukharenkoite-(Ce)] Ba₂Ce(CO₃)₃F – a new mineral. *Scientia Geologica Sinica*, 195–196 (in Chinese with English abs.). (4) Mercier, N. and M. Leblanc (1993) Crystal growth and structures of rare earth fluorocarbonates: II. Structure of zhonghuacerite [= kukharenkoite-(Ce)] Ba₂Ce(CO₃)₃F. *Eur. J. Solid State Inorg. Chem.*, 30, 207–216.

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