Synchysite-(Y) $Ca(Y,Ce)(CO_3)_2F$

Crystal Data: Monoclinic, pseudohexagonal. *Point Group:* $2/m$. Crystals exhibit [using pseudohexagonal indices] $\{11\bar{2}1\}$ and $\{0001\}$, with smaller $\{10\bar{1}0\}$, $\{02\bar{2}1\}$, $\{33\bar{6}5\}$, $\{5.5.\bar{10}.3\}$, to 0.2 mm; typically in very fine-grained aggregates.

Physical Properties: Hardness = ∼4.5 D(meas.) = 3.9 D(calc.) = [3.88]

Optical Properties: Transparent to translucent. *Color:* Red-brown, pale yellow, pale pink, colorless. *Luster:* Greasy.
Optical Class: Uniaxial (+). $\omega = 1.643$–1.645 $\epsilon = 1.73$–1.74

Cell Data: *Space Group:* $C2/c$. $a = 12.039(3)$ $b = 6.950(1)$ $c = 18.436(6)$ $\beta = 102.45(2)^\circ$ Z = 12

X-ray Powder Pattern: Cotopaxi, Colorado, USA.
1.89 (10), 2.00 (9), 1.83 (9), 1.37 (9), 2.75 (8), 3.47 (7), 1.26 (7)

Chemistry:

	(1)	(2)
CO_2	31.4	29.98
Y_2O_3	24.	19.23
Ce_2O_3		27.95
RE_2O_3	[22.1]	
CaO	18.5	19.10
F	5.7	6.47
$-O = F_2$	2.4	2.73
Total	[99.3]	100.00

(1) Near Cotopaxi, Colorado, USA; RE_2O_3 by difference, after deduction of kainosite 10.8% and Fe_2O_3 1%, corresponds to $Ca_{1.0}(Y_{0.6}RE_{0.4})_{\Sigma=1.0}(CO_3)_{2.0}F_{0.9}$. (2) $Ca(Y,Ce)(CO_3)_2F$ with Y:Ce = 1:1.

Occurrence: A rare hydrothermal accessory mineral in alkalic granites and granite pegmatites.

Association: Kainosite, bastnäsite, xenotime, hematite, quartz (Dover, New Jersey, USA).

Distribution: In the USA, from the Scrub Oaks iron mine, Mine Hill, 4 km west of Dover, Morris Co., New Jersey; at the Henry pegmatite, near Cotopaxi, Fremont Co., and the Big Bertha and White Cloud pegmatites, South Platte district, Jefferson Co., Colorado; from Rib Mountain, Marathon Co., Wisconsin. In the Evans-Lou quarry, near Wakefield, Quebec, Canada. Around Gallt y Wenallt, Gwynedd, Wales. On the west flank of Cherbadung [Pizzo Cervandone], Binntal, Valais, Switzerland. At Bad Grund, Harz Mountains, Germany. Crystallized in the Bantyshevo salt stock, Dnieper-Donets Basin, Ukraine. From the Jabal Sa'id pegmatite, central Saudi Arabia. At Xiaocaidan, Qinghai Province, China.

Name: For its relation to *synchysite*-(Ce) and dominant *yttrium*.

Type Material: n.d.

References: (1) Smith, W.L., J. Stone, D.R. Ross, and H. Levine (1960) Doverite [= synchysite-(Y)], a possible new yttrium fluocarbonate from Dover, Morris Co., New Jersey. Amer. Mineral., 45, 92–98. (2) Levinson, A.A. and R.A. Borup (1962) Doverite [= synchysite-(Y)] from Cotopaxi, Colorado. Amer. Mineral., 47, 337–343. (3) Levinson, A.A. (1966) A system of nomenclature for rare-earth minerals. Amer. Mineral., 51, 152–158. (4) Kvasnitsa, V.B., N.B. Navaleva, V.A. Shumlyanskiy, and N.V. Zhikalyak (1990) New rare-earth carbonate and phosphate finds in the Ukraine. Doklady Acad. Nauk SSSR, 314, 455–458 (in Russian). (5) Liben Wang and Kangjing Zhou (1995) The crystal structure of synchysite-(Y), $YCa(CO_3)F$. Acta Petrologica Mineralogica, 14(4), 336–344 (in Chinese with English abs.).