Britholite-(Ce) $(Ce,Ca)_5(SiO_4,PO_4)_3(OH,F)$

Crystal Data: Hexagonal. *Point Group:* $6/m$. Crystals are hexagonal prisms, to 1 cm; granular, massive.

Physical Properties: *Fracture:* Conchoidal. Hardness = 5 D(meas.) = 4.20–4.69 D(calc.) = 4.65

Optical Properties: Opaque, transparent only in thin flakes. *Color:* Brown, yellow-brown, blue. *Luster:* Adamantine.
Optical Class: Uniaxial (–) or biaxial (–). *Pleochroism:* May be O = brown; E = colorless.
n = 1.77–1.81 2V(meas.) = 44°

Cell Data: *Space Group:* $P6_3/m$. a = 9.61(2) c = 7.03(2) Z = 2

X-ray Powder Pattern: Oka, Canada.
2.836 (vs), 3.480 (s), 2.809 (s), 1.858 (s), 4.116 (m), 3.927 (m), 3.211 (m)

Chemistry:	(1)	(2)	(3)
SiO_2	16.77	12.28	20.89
TiO_2		0.09	
ThO_2		5.62	20.73
UO_2			1.47
Al_2O_3		0.47	0.00
$(Ce,La)_2O_3$	60.54	33.43	
La_2O_3			7.35
Ce_2O_3			18.61
Pr_2O_3			1.64
Nd_2O_3			5.1
Fe_2O_3	0.43	0.14	
MgO	0.13	0.20	
CaO	11.28	28.84	19.92
Na_2O	1.85	0.21	
F	1.33	2.10	
H_2O^+	1.27	0.54	
P_2O_5	6.48	16.96	4.3
$-O=F_2$		0.90	
Total	100.08	99.98	100.01

(1) Naujakasik, Greenland. (2) Oka, Canada. (3) Monte Somma, Italy; by electron microprobe, average of ten analyses; corresponds to $(Ca_{2.77}Ce_{0.88}Th_{0.62}La_{0.35}Nd_{0.24}Pr_{0.08}U_{0.04})_{\Sigma=4.98}(Si_{2.71}P_{0.47})_{\Sigma=3.18}O_{12}(OH)$.

Occurrence: In nepheline syenites, pegmatites, and contact deposits related to them.

Association: Zircon, pyrochlore, titanite, fluorite, diopside, andradite, allanite, vesuvianite.

Distribution: At Naujakasik, in the Ilímaussaq intrusion, southern Greenland. From about three km east of Jamestown, Boulder Co., Colorado, USA. At Oka and Mont Saint-Hilaire, Quebec, Canada. From the Pibnesburg complex, Rustenburg, Transvaal, South Africa. In the San Vito quarry, Monte Somma, Campania, Italy. At Tvedalen, Norway. From Tungpei, not otherwise located in China. In the Ishim complex, northern Kazakhstan. From the Khibiny massif, Kola Peninsula; the Kyshtym district, Ural Mountains; and other less-well-defined localities in Russia.

Name: From the Greek for *weight*, in allusion to its density, and its content of *cerium*.

Type Material: University of Copenhagen, Copenhagen, Denmark; The Natural History Museum, London, England, 85379.

References: (1) Dana, E.S. and W.E. Ford (1909) Dana's system of mineralogy, (6th edition), app. II, 19–20. (2) Gay, P. (1957) An investigation of some rare-earth silicates: cerite, lessingite, beckelite, britholite and stillwellite. Mineral. Mag., 31, 455–468. (3) Hughson, M.R. and J.G. Sen (1964) A thorian intermediate member of the britholite–apatite series. Amer. Mineral., 49, 937–951. (4) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 297–300. (5) Deyu Li, Peiling Wang, and Jiancheng Li (1981) The crystal structure of lessingite [britholite-(Ce)], rich in light rare earth of cerium. Guisuanyan Xuebao, 9(4), 422–432. (6) (1982) Chem. Abs., 226893 (abs. ref. 5). (7) Orlandi, P., N. Perchiazzi, and G. Mannucci (1989) First occurrence of britholite-(Ce) in Italy (Monte Somma, Vesuvius). Eur. J. Mineral., 1, 723–725.