Nioboaeschynite-(Ce) $(Ce, Ca, Th)(Nb, Ti)_2(O, OH)_6$

Crystal Data: Orthorhombic; commonly metamict. *Point Group:* $2/m\ 2/m\ 2/m$. In prismatic crystals, may be tabular, striated; as grains, to 1.5 mm.

Physical Properties: *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 4.5–5.5 VHN = 593–683 D(meas.) = 4.97–5.13 D(calc.) = [5.16]

Optical Properties: Translucent to opaque. *Color:* Black, red-brown to dark brown; red to red-brown in thin fragments. *Streak:* Orange to reddish brown. *Luster:* Resinous. *Optical Class:* Isotropic when metamict. *Pleochroism:* Weak; X = red, reddish brown, yellowish brown; Y = reddish brown to brown; Z = reddish brown to dark brown. $n = 2.26$ when metamict. $\alpha = 2.27$–2.28 $\beta = 2.32$–2.38 $\gamma = 2.36$–2.50 2V(meas.) = 75°–97°

Cell Data: *Space Group: Pmnb.* $a = 7.50$–7.86 $b = 10.97$–11.09 $c = 5.32$–5.38 Z = [4]

X-ray Powder Pattern: Tofty tin belt, Alaska, USA (non-metamict); commonly amorphous to X-rays.
2.983 (10), 3.048 (7), 3.132 (4), 5.539 (2), 3.445 (2), 2.827 (2), 2.699 (2)

Chemistry:

	(1)	(2)		(1)	(2)
U_3O_8		0.01	Fe_2O_3	2.75	
Nb_2O_5	41.41	47.0	FeO		1.09
Ta_2O_5	0.00	< 0.1	MnO	trace	
SiO_2	0.35	3.51	MgO	trace	
TiO_2	18.73	20.2	CaO	4.82	4.52
ThO_2	2.52	1.33	H_2O^+	0.41	
Al_2O_3	0.35	n.d.	H_2O^-	0.04	
RE_2O_3	28.17	28.38	Total	99.55	106.

(1) Vishnevy Mountains, Russia; Nb:Ti = 1.05:0.79; RE = La 14%, Ce 42%, Pr 9%, Nd 25%, Sm 3.1%, Eu 0.4%, Gd 1.3%, Tb 0.2%, Dy 1.2%, Ho 0.2%, Er 0.3%, Yb 0.2%, Y ∼3%. (2) Tofty tin belt, Alaska, USA; by emission spectroscopy, RE = La_2O_3 4.9%, Ce_2O_3 15.8%, Pr_2O_3 1.9%, Nd_2O_3 5.6%, Y_2O_3 0.18%; corresponds to $(Ce_{0.32}Ca_{0.27}Nd_{0.11}La_{0.10}Fe_{0.05}Pr_{0.04}Th_{0.02}Y_{0.01})_{\Sigma=0.92}(Nb_{1.17}Ti_{0.83})_{\Sigma=2.00}(O, OH)_{5.78}$.

Occurrence: In quartz-arfvedsonite veinlets cutting fenites (Vishnevy Mountains, Russia); in heavy-mineral concentrates (Tofty tin belt, Alaska, USA).

Association: Quartz, arfvedsonite (Vishnevy Mountains, Russia).

Distribution: In the Vishnevy Mountains, Southern Ural Mountains, Russia. At undisclosed localities in China. From the Tofty tin belt, Manley Hot Springs district, Alaska, USA. At Manjaka, Madagascar.

Name: For similarity to *aeschynite* but with NIOBium greater than titanium, with cerium as the dominant rare-earth element.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, vis6310.

References: (1) Zhabin, A.G., G.N. Mukhitdinov, and M.Y. Kazakova (1960) Paragenetic associations of accessory rare-earth minerals in exocontact fenitized rocks of miaskite intrusives of the Vishnevy Mountains [nioboaeschynite]. Inst. mineral., geokhim., krystallokhim. redkikh elementov, Trudy, 4, 51–73 (in Russian). (2) (1962) Amer. Mineral., 47, 417 (abs. ref. 1). (3) Rosenblum, S. and E.L. Mosier (1975) Nonmetamict nioboeschynite-(Ce) [nioboaeschynite-(Ce)] from Alaska. Amer. Mineral., 60, 309–315.