Okanoganite-(Y) $(Na,Ca)_3(Y,Ce)_{12}B_2Si_6O_{27}F_{14}$

Crystal Data: Hexagonal. *Point Group:* 3m. As twinned pseudotetrahedral crystals, to 4 mm, and groups of such crystals. Twinning: With twin plane (0114), producing fourlings, the (0001) face of each individual crystal forming the faces of a pseudotetrahedron.

Physical Properties: Hardness = 4 D(meas.) = 4.35(4) D(calc.) = 4.96

Optical Properties: Transparent to translucent. *Color:* Tan to pale pink; colorless in thin fragments. *Streak:* White.
Optical Class: Uniaxial (-). ω = 1.753(2) ε = 1.740(2)

Cell Data: Space Group: *R3m*. *a* = 10.7108(5) *c* = 27.0398(11) Z = 3

X-ray Powder Pattern: Golden Horn batholith, Washington, USA.
2.970 (100), 2.939 (95), 2.926 (50), 3.11 (48), 1.784 (43), 4.35 (41), 1.978 (35)

Chemistry:

	(1)
SiO_2	14.35
TiO_2	0.50
B_2O_3	3.1
Y_2O_3	20.46
RE_2O_3	44.29
FeO	1.60
PbO	0.63
CaO	3.24
Na_2O	2.74
F	11.15
$-O = F_2$	4.69
Total	97.37

(1) Golden Horn batholith, Washington, USA; by electron microprobe, B by spectrophotometer, RE_2O_3 = La_2O_3 5.88%, Ce_2O_3 15.42%, Pr_2O_3 1.83%, Nd_2O_3 7.70%, Sm_2O_3 1.64%, Gd_2O_3 5.28%, Tb_2O_3 0.44%, Dy_2O_3 2.08%, Ho_2O_3 0.96%, Er_2O_3 1.26%, Tm_2O_3 0.20%, Yb_2O_3 0.79%, Lu_2O_3 0.81%; corresponds to $(Na_{2.13}Ca_{0.80}Pb_{0.07})_{\Sigma=3.00}[(Y,RE)_{10.64}Ca_{0.59}Fe_{0.54}]_{\Sigma=11.77}B_{2.15}(Si_{5.76}Ti_{0.15})_{\Sigma=5.91}O_{27}F_{14.15}$.

Occurrence: In miarolitic cavities in a peralkalic arfvedsonite-bearing granite.

Association: Quartz, microcline, zircon, arfvedsonite, bastnäsite, zektzerite, astrophyllite.

Distribution: From the Golden Horn batholith, near Washington Pass, Okanogan Co., Washington, USA.

Name: For Okanogan Co., Washington, USA, and the yttrium content.

Type Material: National Museum of Natural History, Washington, D.C., USA; 142512-142514.

References: (1) Boggs, R. (1980) Okanoganite, a new rare-earth borofluorosilicate from the Golden Horn batholith, Okanogan County, Washington. Amer. Mineral., 65, 1138-1142.
(2) Boiocchi, M., A. Callegari, L. Ottolini, and A. Maras (2004) The chemistry and crystal structure of okanoganite-(Y) and comparison with vicanite-(Ce). Amer. Mineral., 89, 1540-1545.
(3) (2005) Amer. Mineral., 90, 772-773 (abs. ref. 2).