Hiortdahlite $(Ca,Na)_3(Zr,Ti)Si_2O_7(O,F)_2$

Crystal Data: Triclinic. *Point Group:* $\overline{1}$. Crystals tabular parallel to {100}, with {010} and {101}. *Twinning:* Polysynthetic twinning on {010} and {100}, common.

Physical Properties: *Cleavage:* Distinct on {110} and {1$\overline{1}$0}, the two intersecting at nearly 90°. *Tenacity:* Very brittle. Hardness = 5.5 D(meas.) = 3.25–3.31 D(calc.) = [3.21–3.24]

Optical Properties: Semitransparent. *Color:* Light yellow to honey-yellow, yellowish brown, green. *Luster:* Vitreous on crystal faces, greasy on fractures.
Optical Class: Biaxial (+). *Pleochroism:* X = nearly colorless; Y = bright yellow; Z = wine-yellow. *Dispersion:* $r < v$, strong. *Absorption:* $Z > Y > X$. α = 1.639–1.658 β = 1.643–1.664 γ = 1.646–1.671 2V(meas.) = 80°–86°

Cell Data: *Space Group:* $P\overline{1}$. $a = 10.95(3)$ $b = 10.31(2)$ $c = 7.29(3)$ $\alpha = 90°19(10)'$ $\beta = 109°2(15)'$ $\gamma = 90°5(10)'$ Z = [4], or *Space Group:* $P\overline{1}$. $a = 11.0149(9)$ $b = 10.9409(9)$ $c = 7.3534(3)$ $\alpha = 109.350(3)°$ $\beta = 109.879(4)°$ $\gamma = 83.434(4)°$ Z = [4]

X-ray Powder Pattern: Kipawa River, Canada.
2.87 (100), 3.00 (90), 3.28 (45), 1.70 (40), 1.84 (30), 2.03 (25), 1.80 (25)

Chemistry:

	(1)		(1)		(1)
SiO_2	32.20	RE_2O_3	2.08	SrO	0.03
TiO_2	0.30	Fe_2O_3	0.27	Na_2O	6.85
ZrO_2	18.76	Nb_2O_5	0.56	K_2O	0.02
HfO_2	0.27	U_3O_8	0.09	F	6.69
SnO_2	0.02	MnO	0.30	H_2O^+	0.42
Al_2O_3	0.07	MgO	0.09	$-O = F_2$	2.81
Y_2O_3	3.50	CaO	29.57	Total	99.28

(1) Kipawa River, Canada; corresponding to $(Ca_{2.01}Na_{0.85}Y_{0.12}RE_{0.04})_{\Sigma=3.02}(Zr_{0.58}Nb_{0.02}Mn_{0.02}Ti_{0.01}Fe_{0.01}Mg_{0.01}Al_{0.01})_{\Sigma=0.66}Si_{2.05}O_7[F_{1.34}O_{0.41}(OH)_{0.18}]_{\Sigma=1.93}$.

Polymorphism & Series: Topological variants I and II, both triclinic.

Occurrence: A rare mineral in alkalic rocks, their pegmatites, and metamorphosed equivalents; in miarolitic cavities in sanidinites.

Association: Feldspar, biotite, meliphanite, titanite (Langesundsfjord, Norway); aegirine, astrophyllite, nepheline (Korgeredaba massif, Russia).

Distribution: In Norway, on Mittel Arø, Lille Arø, and Stokkø Islands, in the Langesundsfjord. In Italy, at Monte Somma and Vesuvius, Campania. From Mayen, Eifel district, Germany. At the Kangerdlugssuaq Fjord, Greenland. In Russia, in the Korgeredaba massif, Sangilen, Tuva. From the [Sheffield Lake complex,] Kipawa River, Villedieu Township, Quebec, Canada. On the Los Islands, Guinea. From the Jingera complex, New South Wales, Australia.

Name: After Professor Thorstein Hallager Hiortdahl (1839–1925), mineralogist of Kristiania (now Oslo), Norway.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 377–378. (2) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 379–381 (3) Aarden, H.M. and J. Gittins (1974) Hiortdahlite from Kipawa River, Villedieu Township, Temiscaming County, Quebec, Canada. Can. Mineral., 12, 241–247. (4) Eggleton, R.A., G.E. Halford, and S.D. Beams (1979) Hiortdahlite from Jingera, New South Wales. J. Geol. Soc. Aust., 26, 81–85. (5) Merlino, S. and N. Perchiazzi (1985) The crystal structure of hiortdahlite I. Tschermaks Mineral. Petrog. Mitt., 34, 297–310. (6) Merlino, S. and N. Perchiazzi (1987) The crystal structure of hiortdahlite II. Mineral. Petrol., 37, 25–35.