Rinkite $(Ca, Ce)_4Na(Na, Ca)_2Ti(Si_2O_7)_2F_2(O, F)_2$

Crystal Data: Monoclinic. *Point Group:* $2/m$ or 2. Crystals prismatic along [001] and flattened on {100}, with {*hk*0} faces strongly striated, to 10 cm; massive. *Twinning:* Lamellar, polysynthetic on {100}.

Physical Properties: *Cleavage:* Distinct on {100}. *Fracture:* Uneven, conchoidal. *Tenacity:* Brittle. Hardness = 4–5 D(meas.) = 3.18–3.44 D(calc.) = 3.36 Green cathodoluminescence.

Optical Properties: Opaque, translucent in thin fragments. *Color:* Reddish brown; alters to dull greenish or yellowish brown; bright red in transmitted light. *Streak:* Pale yellow, grayish brown, white. *Luster:* Vitreous on fractures, resinous to greasy on cleavages. *Optical Class:* Biaxial (+). *Pleochroism:* Slight, in yellow tints. *Orientation:* $X \wedge c = 3°$. *Absorption:* $Z > Y > X$. α = 1.643–1.662 β = 1.645–1.667 γ = 1.651–1.681 2V(meas.) = 43°–87°

Cell Data: *Space Group:* $P2_1/c$ or $P2_1$. $a = 5.679(3)$ $b = 7.412(3)$ $c = 18.835(6)$ $\beta = 101.26(3)°$ Z = 2

X-ray Powder Pattern: Ilímaussaq intrusion, Greenland.
3.071 (100), 2.702 (70), 2.945 (40), 2.798 (40), 1.853 (30), 3.581 (25), 2.024 (25)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	30.71	29.08	MnO	0.45	
TiO_2	5.33	13.36	MgO	0.63	
ZrO_2	7.43		CaO	22.53	23.26
ThO_2	0.34		Na_2O	2.44	8.98
Y_2O_3	3.52	0.92	K_2O	0.38	
ΣLa_2O_3	10.45		F	2.06	5.82
Ce_2O_3	6.04	21.25	H_2O^+	7.70	
Fe_2O_3	0.56	0.44	$-O = F_2$	0.86	2.45
			Total	99.71	100.66

(1) Langesundsfjord, Norway. (2) Julianehåb district, Greenland. (3) Khibiny massif, Kola Peninsula, USSR; by electron microprobe, analysis not given but stated to correspond to $(Ca_{3.7}Na_{2.4}Ce_{0.32}Nd_{0.19}La_{0.10}Y_{0.09}Pr_{0.05}Sm_{0.05}Sr_{0.15})_{\Sigma=7.05}(Ti_{0.92}Nb_{0.06}Zr_{0.03})_{\Sigma=1.01}$ $Si_{3.85}O_{14}F_{2.55}O_{1.3}$.

Occurrence: Characteristic of some nepheline syenites and related pegmatites.

Association: Arfvedsonite, aegirine, eudialyte, steenstrupine, leucophanite, wöhlerite, rosenbuschite, sodalite.

Distribution: From the Kangerdluarssuk Plateau, in the Ilímaussaq intrusion, southern Greenland. On the Islands of Låven and Stokkø, and at Barkevik, Langesundsfjord, Norway. In the Khibiny and Lovozero massifs, Kola Peninsula, Russia. At the Dara-i-Pioz massif, Alai Range, Tien Shan, Tajikistan. From Mont Saint-Hilaire and near Saint-Amable, Quebec, and in the Red Wine complex, Labrador, Newfoundland, Canada.

Name: For Dr. H. Rink, at one time Director of Danish-Greenland commerce.

Type Material: University of Copenhagen, Copenhagen, Denmark, 2,3.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 722 (rinkite), 721–722 (mosandrite), 720–721 (johnstrupite). (2) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 312–316. (3) Sahama, G. and K. Hytönen (1957) Unit cell of mosandrite [rinkite], johnstrupite and rinkite. Geol. Fören. Förhandl. Stockholm, 79, 791–796. (4) Galli, E. and A. Alberti (1971) The crystal structure of rinkite. Acta Cryst., 27, 1277–1284. (5) Rastsvetaeva, R.K., B.E. Borutskii, and A.V. Shlyukova (1992) Crystal structure of Hibbing [Khibiny] rinkite. Kristallografiya (Sov. Phys. Crystal.), 36, 632–636 (in Russian).