

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. Crystals elongated along [001] and flattened on {010}, displaying {010}, {100}, {001}, {110}, and {011}. As spherulites to 2 cm and sprays to 0.5 mm.

Physical Properties: *Cleavage:* Perfect on (010); parting $\perp$ [001]. *Fracture:* Stepped.
Tenacity: Brittle. *Hardness* ≈ 3 *D(meas.)* = 3.66(2) *D(calc.)* = 3.694

Optical Properties: Transparent. *Color:* Brown, yellowish brown in transmitted light.
Streak: Pale yellowish brown. *Luster:* Vitreous, silky in aggregates.
Optical Class: Biaxial (+). $\alpha = 1.708(5)$ $\beta = 1.76(1)$ $\gamma = 1.82(1)$ $2V(\text{calc.}) = 89(5)^\circ$
Orientation: $Y \wedge c = 5^\circ$.

Cell Data: *Space Group:* $P\bar{1}$. $a = 5.009(5)$ $b = 7.533(5)$ $c = 15.407(5)$ $\alpha = 103.061(5)^\circ$
 $\beta = 91.006(5)^\circ$ $\gamma = 109.285(5)^\circ$ $Z = 2$

X-ray Powder Pattern: Mt. Kihlman, Khibiny massif, Kola Peninsula, Russia.
 15.11 (100), 7.508 (20), 3.563 (15), 2.896 (15), 4.993 (14), 6.912 (12), 3.065 (12)

Chemistry:	(1)		(1)
Na ₂ O	0.13	Ce ₂ O ₃	27.33
Al ₂ O ₃	0.24	Pr ₂ O ₃	2.45
SiO ₂	9.91	Nd ₂ O ₃	8.12
CaO	1.50	Sm ₂ O ₃	1.67
TiO ₂	11.04	Gd ₂ O ₃	0.49
MnO	0.26	CO ₂	15.00
Fe ₂ O ₃	0.05	<u>H₂O</u>	<u>6.00</u>
Nb ₂ O ₅	2.79	Total	99.93
La ₂ O ₃	12.95		

(1) Mt. Kihlman, Khibiny massif, Kola Peninsula, Russia; average electron microprobe analysis, H₂O and CO₂ by Penfield method and wet chemical analysis, identity of anionic groups determined by IR spectroscopy; corresponding to $(\text{Ca}_{0.16}\text{Na}_{0.11}\text{Mn}_{0.02})_{\Sigma=0.29}[(\text{Ce}_{0.98}\text{La}_{0.47}\text{Pr}_{0.09}\text{Nd}_{0.29}\text{Sm}_{0.06}\text{Gd}_{0.02})_{\Sigma=1.91}(\text{Ti}_{0.82}\text{Nb}_{0.12})_{\Sigma=0.94}\text{O}_2(\text{Si}_{0.97}\text{Al}_{0.03})_{\Sigma=1.00}\text{O}_{4.02}(\text{HCO}_3)_{2.01}](\text{H}_2\text{O})_{0.96}$.

Occurrence: In a symmetrically-zoned pegmatite vein of arfvedsonite-aegirine-microcline in fenitized metavolcanic rock. Probably the product of low-temperature hydrothermal alteration of rinkite and loparite-(Ce).

Association: Tundrite-(Ce).

Distribution: From Mt. Kihlman, near the western contact of the Khibiny alkaline massif, Kola Peninsula, Russia.

Name: Honors Alfred Oswald Kihlman (Kairamo) (1858-1938), a Finnish geographer and botanist, for whom Mt Kihlman and the mineral are named.

Type Material: Mineralogical Museum, St. Petersburg State University (1/19598) and in the Geological and Mineralogical Museum, Geological Institute of the Kola Science Centre, Apatity, (GIM 6790), Russia.

References: (1) Yakovenchuk, V.N., S.V. Krivovichev, G.Y. Ivanyuk, Ya.A. Pakhomovsky, E.A. Selivanova, E.A. Zhitova, G.O. Kalashnikova, A.A. Zolotarev, J.A. Mikhailova, and G.I. Kadyrova (2014) Kihlmanite-(Ce), $\text{Ce}_2\text{TiO}_2[\text{SiO}_4](\text{HCO}_3)_2(\text{H}_2\text{O})$, a new rare-earth mineral from the pegmatites of the Khibiny alkaline massif, Kola Peninsula, Russia. *Mineral. Mag.*, 78(3), 483-496. (2) (2015) *Amer. Mineral.*, 100, 2354 (abs. ref. 1).