

**Kochite****Ca<sub>2</sub>MnZrNa<sub>3</sub>Ti(Si<sub>2</sub>O<sub>7</sub>)<sub>2</sub>(OF)F<sub>2</sub>**

**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . As lath-shaped to acicular grains, elongate along [010], in parallel to subparallel aggregates to 1.0 mm.

**Physical Properties:** *Cleavage:* Perfect {100}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5 (by analogy to rosenbuschite) D(meas.) = 3.32(1) D(calc.) = 3.31

**Optical Properties:** Transparent. *Color:* Pale brown. *Streak:* n.d. *Luster:* Vitreous. *Optical Class:* Biaxial (+).  $\alpha = 1.684(2)$   $\beta = 1.695(4)$   $\gamma = 1.718(2)$   $2V(\text{meas.}) = 73(2)^\circ$   $2V(\text{calc.}) = 70^\circ$  *Orientation:*  $X = c$ ,  $Z \wedge [100] = \sim 20^\circ$ . *Pleochroism:* Weak,  $X =$  colorless,  $Z =$  pale yellow.

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 10.032(2)$   $b = 11.333(2)$   $c = 7.202(1)$   $\alpha = 90.192(4)^\circ$   $\beta = 100.334(5)^\circ$   $\gamma = 111.551(4)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Hvide Ryg, Werner Bjergerange, eastern coast of Greenland. 2.908 (100), 2.600 (80), 3.028 (60), 1.868 (60), 1.670 (50), 3.951 (30), 2.462 (20)

<b>Chemistry:</b>	(1)		(1)
Na <sub>2</sub> O	10.33	Ce <sub>2</sub> O <sub>3</sub>	0.57
CaO	21.39	SiO <sub>2</sub>	31.55
SrO	0.12	TiO <sub>2</sub>	8.44
MgO	0.01	ZrO <sub>2</sub>	12.12
MnO	4.92	HfO <sub>2</sub>	0.09
FeO	1.08	Nb <sub>2</sub> O <sub>5</sub>	1.86
Al <sub>2</sub> O <sub>3</sub>	0.05	Ta <sub>2</sub> O <sub>5</sub>	0.02
V <sub>2</sub> O <sub>3</sub>	0.03	F	6.83
Y <sub>2</sub> O <sub>3</sub>	0.39	<u>- O = F</u>	<u>2.88</u>
La <sub>2</sub> O <sub>3</sub>	0.25	Total	97.71

(1) Hvide Ryg, Werner Bjergerange, eastern coast of Greenland; average of four electron microprobe analyses supplemented by IR spectroscopy; corresponds to (Na<sub>0.85</sub>Sr<sub>0.01</sub>) $\Sigma=0.86$  (Na<sub>1.38</sub>Ca<sub>0.62</sub>) $\Sigma=2.00$  (Ca<sub>1.70</sub>Na<sub>0.30</sub>) $\Sigma=2.00$  (Mn<sub>0.53</sub>Ca<sub>0.41</sub>Y<sub>0.02</sub>Ce<sub>0.02</sub>La<sub>0.01</sub>) $\Sigma=0.98$  (Zr<sub>0.70</sub>Fe<sub>0.12</sub>Ca<sub>0.18</sub>Hf<sub>0.005</sub>) $\Sigma=1.00$  (Ti<sub>0.80</sub>Nb<sub>0.10</sub>Zr<sub>0.05</sub>Al<sub>0.02</sub>V<sub>0.01</sub>) $\Sigma=0.98$  (Si<sub>2</sub>O<sub>7</sub>)<sub>2</sub>F<sub>2</sub>(O<sub>1.20</sub>F<sub>0.74</sub>) $\Sigma=1.94$ .

**Mineral Group:** Seidozerite supergroup, rinkite group.

**Occurrence:** An accessory phase in nepheline syenite in an alkaline complex.

**Association:** Nepheline, alkali feldspar, låvenite.

**Distribution:** In a loose block found between the Sirius Glacier and the northern side of Hvide Ryg, Werner Bjergerange, eastern coast of Greenland.

**Name:** Honors Danish geologist Lauge *Koch* (1892-1964), who mapped Werner Bjergerange.

**Type Material:** Geological Museum, University of Copenhagen, Denmark (GM 2002.94).

**References:** (1) Christiansen, C.C., R.A. Gault, J.D. Grice, and O. Johnsen (2003) Kochite, a new member of the rosenbuschite group from the Werner Bjergerange alkaline complex, East Greenland. *Eur. J. Mineral.*, 15, 551-554. (2) (2004) *Amer. Mineral.*, 89(1), 250 (abs. ref. 1). (3) Sokolova E. and F. Cámara (2017) The seidozerite supergroup of TS-block minerals: nomenclature and classification, with change of the following names: rinkite to rinkite-(Ce), mosandrite to mosandrite-(Ce), hainite to hainite-(Y) and innelite-1T to innelite-1A. *Mineral. Mag.*, 81(6), 1457-1484.