

**Kamphaugite-(Y)****CaY(CO<sub>3</sub>)<sub>2</sub>(OH)·H<sub>2</sub>O**

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**Crystal Data:** Tetragonal. *Point Group:* 422. Crystals are rough, platy on {001}, with a square or octagonal outline, commonly in subparallel aggregates forming rosettes or spherules, to 4 mm; also as fine-grained masses and coatings.

**Physical Properties:** *Fracture:* Uneven. *Tenacity:* Brittle. *Hardness* = 2–3  
D(meas.) = 3.19(5) D(calc.) = 3.11

**Optical Properties:** Transparent to translucent. *Color:* White to colorless, may be pale brown, pale yellow, or grayish brown. *Streak:* White. *Luster:* Vitreous.

*Optical Class:* Uniaxial (+), anomalously biaxial (+). *Orientation:* X = c.  $\omega = 1.611\text{--}1.620$   
 $\epsilon = 1.636\text{--}1.642$   $\alpha = 1.627(2)$   $\beta = 1.663(2)$   $\gamma = 1.663(2)$   $2V(\text{meas.}) = \sim 15^\circ$

**Cell Data:** *Space Group:* P4<sub>1</sub>2<sub>1</sub>2.  $a = 7.434(1)$   $c = 21.793(3)$   $Z = 8$

**X-ray Powder Pattern:** Hørtekollen deposit, Norway.

6.140 (100), 2.631 (90), 4.381 (80), 3.516 (60), 2.831 (50), 1.891 (30), 2.723 (20)

**Chemistry:**

	(1)	(2)
CO <sub>2</sub>	29.6	31.00
Y <sub>2</sub> O <sub>3</sub>	30.5	39.75
Nd <sub>2</sub> O <sub>3</sub>	1.4	
Sm <sub>2</sub> O <sub>3</sub>	0.8	
Gd <sub>2</sub> O <sub>3</sub>	1.6	
Dy <sub>2</sub> O <sub>3</sub>	2.1	
Er <sub>2</sub> O <sub>3</sub>	1.2	
Yb <sub>2</sub> O <sub>3</sub>	1.1	
CaO	18.4	19.74
H <sub>2</sub> O	12.1	9.51
Total	98.8	100.00

(1) Hørtekollen deposit, Norway; by electron microprobe, average of five analyses, BeO 0.8% by AA from helvite subtracted, CO<sub>2</sub> and H<sub>2</sub>O by CHN analyzer; corresponds to Ca<sub>0.98</sub>(Y<sub>0.80</sub>RE<sub>0.14</sub>)<sub>Σ=0.94</sub>(CO<sub>3</sub>)<sub>2</sub>(OH)<sub>0.77</sub>·1.61H<sub>2</sub>O. (2) CaY(CO<sub>3</sub>)<sub>2</sub>(OH)·H<sub>2</sub>O.

**Occurrence:** A late, low-temperature mineral formed in a contact-metamorphic skarn (Hørtekollen deposit, Norway); in metasomatically altered alkali granite (Kazakhstan); in a quartz–barite vein in a carbonatized volcano (South Africa).

**Association:** Kuliokite-(Y) (Norway); gagarinite (Kazakhstan); kainosite-(Y), hingganite-(Y) (Cal Francese, Sardinia, Italy); caysichite-(Y), donnayite-(Y), decrespignyite-(Y) (Paratoo mine, Australia).

**Distribution:** In Norway, from the Hørtekollen deposit, Lier, Buskerud; at the Høydalen granite pegmatite, Tørdal, Telemark; and in the Tangen granite pegmatite, near Kragerø. From the Cala Francese, Sardinia, Italy. At an undisclosed locality [Verkhne-Espe alkaline massif, Tarbagatai Range], Kazakhstan. From an undefined locality [Mt. Ploskaya, Keivy massif], Kola Peninsula, Russia. At Szarvaskő, Bükk Mountains, Hungary. On the Goudini volcano, Transvaal, South Africa. In the Evans-Lou quarry, near Wakefield Lake, Quebec, Canada. At the Gronci-Ellis granite quarry, Mount Desert, Hancock Co., Maine, USA. From the Paratoo copper mine, 30 km southwest of Yunta, Olary district, South Australia.

**Name:** To honor Erling Kamphaug (1931– ), Norwegian mineral collector, who supplied the first specimens.

**Type Material:** Mineralogical-Geological Museum, University of Oslo, Oslo, Norway, 14769.

**References:** (1) Raade, G. and K. Brastad (1993) Kamphaugite-(Y), a new hydrous Ca-(Y,REE)-carbonate mineral. *Eur. J. Mineral.*, 5, 679–683. (2) Rømming, C., A.K. Kocharian, and G. Raade (1993) The crystal structure of kamphaugite-(Y). *Eur. J. Mineral.*, 5, 685–690. (3) (1994) *Amer. Mineral.*, 79, 387–388 (abs. refs. 1–2).

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