

Harkerite

$\text{Ca}_{24}\text{Mg}_8\text{Al}_2(\text{SiO}_4)_8(\text{BO}_3)_6(\text{CO}_3)_{10} \cdot 2\text{H}_2\text{O}$

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Crystal Data: Hexagonal, pseudocubic. *Point Group:* $\bar{3} 2/m$. As simple pseudo-octahedral crystals, to 5 mm. *Twinning:* Observed, with four rhombohedral individuals each ideally oriented $\parallel$ to one of the pseudocubic 3-fold axes.

Physical Properties: Hardness = n.d. $D(\text{meas.}) = 2.95\text{--}2.96$ $D(\text{calc.}) = [3.02]$

Optical Properties: Semitransparent. *Color:* Colorless. *Luster:* Vitreous.

Optical Class: Uniaxial, but typically sensibly isotropic; sections may separate into four fields with weak birefringence in the diagonal position. $n = 1.649\text{--}1.653$

Cell Data: *Space Group:* $R\bar{3}m$. $a = 10.439$ $c = 51.303$ $Z = 3$

X-ray Powder Pattern: Broadford area, Isle of Skye, Scotland.

2.61 (vs), 5.22 (s), 2.13 (s), 1.84 (s), 1.51 (s), 3.39 (m), 3.01 (m)

Chemistry:

	(1)	(2)	(3)
SiO_2	14.17	16.82	16.37
B_2O_3	7.77	7.0	7.11
Al_2O_3	2.84	3.13	3.47
Ce_2O_3		0.8	
Fe_2O_3	0.85	1.78	
FeO	0.46		
MnO	0.02	0.13	
MgO	11.15	10.01	10.98
CaO	46.23	44.13	45.85
SrO		0.2	
F		0.15	
Cl	1.36	0.06	
H_2O^+	0.81	1.25	1.23
H_2O^-	0.11		
CO_2	14.94	15.07	14.99
$-\text{O} = (\text{F}, \text{Cl})_2$	0.31	0.07	
Total	100.40	100.46	100.00

(1) Camas Malag, Isle of Skye, Scotland. (2) Alban Hills, Italy; by electron microprobe, spectrophotometry, elemental analyzer, and mass spectrometer. (3) $\text{Ca}_{24}\text{Mg}_8\text{Al}_2(\text{SiO}_4)_8(\text{BO}_3)_6(\text{CO}_3)_{10} \cdot 2\text{H}_2\text{O}$.

Occurrence: In skarns in dolomitic limestones at the contact with granite (Camas Malag, Scotland); in volcanic ejecta (Alban Hills, Italy).

Association: Calcite, monticellite, diopside, magnetite, vesuvianite, cuspidine, phlogopite.

Distribution: At Camas Malag, near Broadford, Isle of Skye, Scotland. On the Chersky Ridge, Tas-haiatah, northeastern Siberia, Russia. From the Alban Hills, Lazio, Italy. Large crystals at Nordmark, Sweden.

Name: For Alfred Harker (1859–1939), British petrologist, Cambridge University, Cambridge, England.

Type Material: n.d.

References: (1) Tilley, C.E. (1951) The zoned contact-skarns of the Broadford area, Skye: a study of boron-fluorine metasomatism in dolomites. *Mineral. Mag.*, 29, 621–667. (2) (1952) *Amer. Mineral.*, 37, 359 (abs. ref. 1). (3) Ostrovskaya, I.V., N.N. Pertsev, and I.B. Nikitina (1966) Sakhaite, a new carbonate-borate of calcium and magnesium. *Zap. Vses. Mineral. Obshch.*, 95, 193–202 (in Russian). (4) Giuseppetti, G., F. Mazzi, and C. Tadini (1977) The crystal structure of harkerite. *Amer. Mineral.*, 62, 263–272. (5) Barbieri, M., C. Cozzupoli, M. Federico, M. Fornaseri, S. Merlino, P. Orlandi, and L. Tolomeo (1977) Harkerite from the Alban Hills, Italy. *Lithos*, 10, 133–141.

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