

**Sakhaite****Ca<sub>12</sub>Mg<sub>4</sub>(BO<sub>3</sub>)<sub>7</sub>(CO<sub>3</sub>)<sub>4</sub>Cl(OH)<sub>2</sub>•H<sub>2</sub>O**

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**Crystal Data:** Cubic. *Point Group:*  $4/m\bar{3}2/m$ . Massive, in veinlets.**Physical Properties:** Hardness = 5 D(meas.) = 2.78–2.83 D(calc.) = 2.79**Optical Properties:** Transparent. *Color:* Gray to grayish white; colorless in transmitted light.*Luster:* Vitreous to slightly greasy.*Optical Class:* Isotropic.  $n = 1.638$ – $1.641$ **Cell Data:** *Space Group:*  $Fd\bar{3}m$ .  $a = 14.685(3)$   $Z = 4$ **X-ray Powder Pattern:** Titovskoye deposit, Russia.

2.58 (100), 2.108 (56), 5.16 (22), 1.827 (21), 1.951 (14), 2.81 (13), 1.491 (12)

<b>Chemistry:</b>	(1)	(2)		(1)	(2)
CO <sub>2</sub>	14.33	13.36	MgO	12.54	12.24
SiO <sub>2</sub>	0.25		CaO	50.18	51.09
B <sub>2</sub> O <sub>3</sub>	17.65	18.50	F	0.00	
Al <sub>2</sub> O <sub>3</sub>	0.24		Cl	2.63	2.68
Fe <sub>2</sub> O <sub>3</sub>	0.00		H <sub>2</sub> O	2.75	2.74
FeO	0.31		–O = (F, Cl) <sub>2</sub>	0.58	0.61
			<b>Total</b>	<b>100.30</b>	<b>100.00</b>

(1) Titovskoye deposit, Russia; CO<sub>2</sub> and BO<sub>3</sub> confirmed by IR; with (OH)<sup>1-</sup> calculated for charge balance, corresponds to Ca<sub>11.71</sub>Mg<sub>4.07</sub>Fe<sub>0.06</sub>Al<sub>0.06</sub>Si<sub>0.05</sub>(BO<sub>3</sub>)<sub>6.64</sub>(CO<sub>3</sub>)<sub>4.26</sub>Cl<sub>0.97</sub>(OH)<sub>2.65</sub>•0.68H<sub>2</sub>O.(2) Ca<sub>12</sub>Mg<sub>4</sub>(BO<sub>3</sub>)<sub>7</sub>(CO<sub>3</sub>)<sub>4</sub>Cl(OH)<sub>2</sub>•H<sub>2</sub>O.**Occurrence:** In lenses replacing marble at the contact of a granitic massif with dolostone (Titovskoye deposit, Russia).**Association:** Kotoite, clinohumite, forsterite, suanite, spinel, ludwigite, borcarite, szaibélyite, sphalerite (Titovskoye deposit, Russia); szaibélyite, kotoite, fluoborite, stannian ludwigite, forsterite (Daiy Mountain, China).**Distribution:** From the Titovskoye boron deposit, Tas-Khayakhtakh Mountains, Sakha, and at the Solongo boron deposit, Buryatia, Russia. In the Sayak-IV boron deposit, northeast Balkhash region, Kazakhstan. From Daiy Mountain, Qiliping, Human Province, China. At Fuka, near Bicchu, Okayama Prefecture, Japan. In the Kombat Cu–Pb–Ag mine, 49 km south of Tsumeb, Namibia.**Name:** From *Sakha*, the Yakutian word for Yakutia [now Sakha].**Type Material:** A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 67237.**References:** (1) 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). (2) (1966) *Amer. Mineral.*, 51, 1816 (abs. ref. 1). (3) Giuseppetti, G, F. Mazzi, and C. Tadini (1977) The crystal structure of harkerite. *Amer. Mineral.*, 62, 263–272. (4) Yakuovich, O.V., Y.K. Yegorov-Tismenko, M.A. Simonov, and N.V. Belov (1978) Crystal structure determination of sakhaite Ca<sub>3</sub>Mg[BO<sub>3</sub>]<sub>2</sub>[CO<sub>3</sub>]•0.36H<sub>2</sub>O. *Doklady Acad. Nauk SSSR*, 239, 1103–1106 (in Russian). (5) Dunn, P.J., D.R. Peacor, J.A. Nelen, R.A. Ramik, and J. Innes (1990) A sakhaite-like mineral from the Kombat mine in Namibia. *Mineral. Mag.*, 54, 105–108.