

Tengerite-(Y)**Y₂(CO₃)₃•2–3H₂O**

©2001-2005 Mineral Data Publishing, version 1

Crystal Data: Orthorhombic. *Point Group:* *mm2*. Rarely small mammillary with radial fibrous internal structure, to 1 mm; typically in thin coatings and powders.

Physical Properties: Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.110

Optical Properties: Semitransparent. *Color:* White. *Luster:* Dull, chalky.
Optical Class: Biaxial. $\alpha = 1.587$ $\beta = \text{n.d.}$ $\gamma = 1.616$ $2V(\text{meas.}) = \text{n.d.}$

Cell Data: *Space Group:* *Bb2₁m*. $a = 6.078(4)$ $b = 9.157(2)$ $c = 15.114(6)$ $Z = 4$

X-ray Powder Pattern: Ytterby, Sweden.
5.70 (10), 4.62 (10), 3.91 (10), 7.66 (8), 3.59 (8), 2.98 (8), 2.55 (6)

Chemistry:	(1)	(2)	(1)	(2)
CO ₂	[26.9]	32.35	Tb ₂ O ₃	0.7
Y ₂ O ₃	26.5	46.46	Dy ₂ O ₃	6.2
La ₂ O ₃	0.2	0.17	Ho ₂ O ₃	0.7
Ce ₂ O ₃	1.5	0.17	Er ₂ O ₃	1.4
Pr ₂ O ₃	0.6	0.09	Tm ₂ O ₃	0.6
Nd ₂ O ₃	5.1	0.52	Yb ₂ O ₃	0.7
Sm ₂ O ₃	4.4	0.39	Lu ₂ O ₃	0.1
Eu ₂ O ₃	n.d.	0.01	CaO	1.2
Gd ₂ O ₃	6.1	1.00	H ₂ O	[17.1]
			Total	[100.0]
				101.93

(1) Ytterby, Sweden; by X-ray fluorescence analysis, CO₂ calculated for charge balance, H₂O calculated by difference, CaO attributed to impurities; corresponds to (Y_{1.14}Gd_{0.16}Dy_{0.16}Nd_{0.15}Sm_{0.12}Ce_{0.04}Er_{0.04}Tb_{0.02}Pr_{0.02}Yb_{0.02}Ho_{0.02}Tm_{0.01}La_{0.01}) $\Sigma=1.91$ (CO₃)_{2.95}•nH₂O. (2) Iisaka, Japan; by ICP-AES analysis, CaO attributed to impurities; corresponds to (Y_{1.70}Dy_{0.04}Er_{0.03}Yb_{0.02}Gd_{0.02}Nd_{0.01}Ho_{0.01}Sm_{0.01}) $\Sigma=1.84$ C_{3.03}O₉•3.07H₂O.

Occurrence: An alteration coating on yttrium-bearing minerals.

Association: Gadolinite-(Y), lokkaite-(Y), kimuraite-(Y), bastnäsitate-(Ce), lanthanite, synchysite, calcite, quartz.

Distribution: In Sweden, from Ytterby, on Resarö Island, near Vaxholm, and at Åskagen, Värmland. From Rosås, Norway. At the Pyörönmaa pegmatite, Kangasala, and Lövböle, Kemiö, Finland. From Iisaka and Suishoyama, Fukushima Prefecture, Japan. In the Evans-Lou pegmatite, 32 km north of Hull, Quebec, Canada. In the USA, from the Baringer Hill pegmatite, 26 km west of Burnet, and the Rode Ranch pegmatite, near Bluffton, Llano Co., and from the Clear Creek pegmatite, Burnet Co. Texas. Additionally reported localities require modern confirmation.

Name: To honor C. Tenger, Swedish chemist who studied the mineral.

Type Material: National Science Museum, Tokyo, Japan, M25981; National Museum of Natural History, Washington, D.C., USA, R13924.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 275–276. (2) Miyawaki, R., J. Kuriyama, and I. Nakai (1993) The redefinition of tengerite-(Y), Y₂(CO₃)₃•2–3H₂O, and its crystal structure. *Amer. Mineral.*, 78, 425–432.