

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As crystals, to < 0.03 mm.

**Physical Properties:** Hardness = 5–6 D(meas.) = n.d. D(calc.) = 3.62

**Optical Properties:** Transparent. *Color:* Bluish green. *Luster:* Vitreous.  
*Optical Class:* Biaxial (+).  $\alpha = 1.722(1)$   $\beta = 1.723(1)$   $\gamma = 1.734(1)$   $2V(\text{meas.}) = 72.8^\circ$

**Cell Data:** *Space Group:* C2/c.  $a = 10.160(1)$   $b = 10.001(1)$   $c = 19.973(2)$   
 $\beta = 91.56(1)^\circ$   $Z = 4$

**X-ray Powder Pattern:** Sattelberg volcano, Germany.  
3.00 (100), 3.12 (90), 6.70 (70), 2.41 (70), 7.13 (60), 2.45 (60), 1.78 (50)

<b>Chemistry:</b>	(1)
	SiO <sub>2</sub> 48.5
	CuO 34.9
	CaO 15.0
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	Total 98.4

(1) Sattelberg volcano, Germany; by electron microprobe, average of six analyses; corresponding to Ca<sub>2.99</sub>Cu<sub>4.91</sub>Si<sub>9.05</sub>O<sub>26</sub>.

**Occurrence:** In cavities in argillaceous sedimentary xenoliths subjected to very high-grade thermal metamorphism.

**Association:** Cuprorivaite, tenorite, volborthite, calciovolborthite.

**Distribution:** In Germany, at the Sattelberg and Nickenicher Sattel volcanos and the Emmelberg cone, near Kruf, Eifel district.

**Name:** For Dr. Friedrich Liebau, Kiel, Germany, prominent worker on silicate minerals.

**Type Material:** University of Würzburg, Würzburg; and University of Kiel, Kiel, Germany.

**References:** (1) Zöller, M.H., E. Tillmanns, and G. Hentschel (1992) Liebauite, Ca<sub>3</sub>Cu<sub>5</sub>Si<sub>9</sub>O<sub>26</sub>: a new silicate mineral with 14er single chain. *Zeits. Krist.*, 200, 115–126. (2) (1993) *Amer. Mineral.*, 78, 673 (abs. ref. 1).