

**Crystal Data:** Monoclinic. *Point Group:* 2/m. Massive as a core or zones in borcarite crystals.

**Physical Properties:** *Cleavage:* Perfect, in two directions. *Fracture:* n.d. *Tenacity:* n.d.  
Hardness = 4.5 VHN = 376 (25 g load). D(meas.) = 2.96(3) D(calc.) = 2.93  
Easily dissolves with effervescence in dilute hydrochloric acid.

**Optical Properties:** Translucent. *Color:* Blue-green to colorless, colorless to pale blue-green in thin section. *Streak:* White to pale blue-green. *Luster:* Vitreous.  
*Optical Class:* Biaxial (-).  $\alpha = 1.618(2)$   $\beta = 1.658(2)$   $\gamma = 1.672(2)$   $2V(\text{calc.}) = 60^\circ$

**Cell Data:** *Space Group:* C2/m.  $a = 17.799(2)$   $b = 8.389(2)$   $c = 4.451(2)$   $\beta = 102.49(3)^\circ$   
 $Z = 2$

**X-ray Powder Pattern:** Fuka Mine, Okayama Prefecture, Japan.  
7.57 (100), 2.671 (84), 2.727 (68), 1.887 (52), 2.272 (48), 2.899 (44), 1.698 (34)

Chemistry:	(1)
B <sub>2</sub> O <sub>3</sub>	24.09
CaO	38.11
CuO	10.32
MgO	1.02
ZnO	0.51
CO <sub>2</sub>	15.80
<u>H<sub>2</sub>O</u>	<u>9.75</u>
Total	99.60

(1) Fuka Mine, Okayama Prefecture, Japan; average of electron microprobe analyses, anionic groups confirmed by IR spectroscopy, CO<sub>2</sub> and H<sub>2</sub>O by TGA; corresponding to  
 $\text{Ca}_{3.898}(\text{Cu}_{0.744}\text{Mg}_{0.145}\text{Zn}_{0.036})_{\Sigma=0.925}\text{B}_{3.969}\text{O}_{5.615}(\text{OH})_{6.208}(\text{CO}_3)_{2.059}$ .

**Occurrence:** On the wall of cavities in a vein of nifontovite or in fractures in a crystalline limestone near gehlenite-spurrite skarns. Likely formed by Cu- and Mg-bearing late hydrothermal solutions.

**Association:** Borcarite, nifontovite, bultfonteinite, calcite.

**Distribution:** In Japan, at the Fuka Mine, Okayama Prefecture.

**Name:** Honors Tadayuki Numano (1931-2001), Emeritus Professor, Okayama University, Japan.

**Type Material:** Department of Geology, National Science Museum, Tokyo, Japan, (NSM-M28813).

**References:** (1) Ohnishi, M., I. Kusachi, J. Yamakawa, M. Tanabe, S. Kishi, and T. Yasuda (2007) Numanoite,  $\text{Ca}_4\text{CuB}_4\text{O}_6(\text{OH})_6(\text{CO}_3)_2$ , a new mineral species, the Cu analogue of borcarite from the Fuka mine, Okayama Prefecture, Japan. *Can. Mineral.*, 45, 307-315. (2) (2007) *Amer. Mineral.*, 92, 1778 (abs. ref. 1).