

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 ₂ O ₃	24.09
CaO	38.11
CuO	10.32
MgO	1.02
ZnO	0.51
CO ₂	15.80
H ₂ O	9.75
Total	99.60

(1) Fuka Mine, Okayama Prefecture, Japan; average of electron microprobe analyses, anionic groups confirmed by IR spectroscopy, CO₂ and H₂O 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).