

Crystal Data: Monoclinic. *Point Group:* 2/m. Prismatic crystals, to several cm, elongated along [100], typically in radiating fibrous aggregates.

Physical Properties: *Cleavage:* One, || elongation, distinct. *Hardness* = 4–4.5
D(meas.) = 2.58–2.60 D(calc.) = 2.58 Fluoresces violet under LW UV.

Optical Properties: Transparent. *Color:* Colorless. *Luster:* Vitreous.
Optical Class: Biaxial (+), anomalous dark blue and brown interference colors may be observed. *Dispersion:* $r > v$, strong. $\alpha = 1.604\text{--}1.605$ $\beta = 1.609\text{--}1.611$ $\gamma = 1.615\text{--}1.618$
2V(meas.) = 85° 2V(calc.) = 86°

Cell Data: *Space Group:* $P2_1/n$. $a = 6.923\text{--}6.927$ $b = 12.326\text{--}12.331$ $c = 9.831\text{--}9.836$
 $\beta = 97.09^\circ\text{--}97.81^\circ$ $Z = 4$

X-ray Powder Pattern: Novofrolovskoye deposit, Russia.
7.61 (10), 2.13 (10), 2.97 (9), 1.407 (8), 6.18 (6), 3.42 (6), 4.81 (5).

Chemistry:	(1)	(2)	(3)
B ₂ O ₃	38.06	43.42	43.05
SiO ₂	4.00		
Al ₂ O ₃	1.12		
Fe ₂ O ₃	2.13		
MgO	0.67		
CaO	35.27	34.87	34.67
H ₂ O ⁺	19.08	21.88	
H ₂ O ⁻	0.00	0.54	
H ₂ O			22.28
Total	100.33	100.71	100.00

(1) Novofrolovskoye deposit, Russia; after deducting andradite–grossular and szaibélyite, corresponds to Ca_{1.05}B_{2.00}O_{1.95}(OH)₄. (2) Fuka, Japan; CaO by electron microprobe, B₂O₃ by ICP, H₂O by TGA; corresponds to Ca_{1.01}B_{2.02}O_{2.07}(OH)_{3.93}. (3) CaB₂O₂(OH)₄.

Polymorphism & Series: Dimorphous with vimsite.

Occurrence: A rare secondary mineral in boron-rich iron-ore skarns (Novofrolovskoye deposit, Russia); in a vein cutting limestone (Fuka, Japan).

Association: Andradite–grossular, magnetite, szaibélyite, frolovite (Novofrolovskoye deposit, Russia); sibirskite, borcarite, fluorite, calcite (Fuka, Japan).

Distribution: In Russia, from the Novofrolovskoye copper deposit, near Krasnoturinsk, Turinsk district, Northern Ural Mountains, and in the Solongo boron deposit, Buryatia. Found at Fuka, near Bicchu, Okayama Prefecture, Japan.

Name: For the original locality in the URAL Mountains, Russia, and BORate in its composition.

Type Material: Vernadsky Geological Museum, Moscow, 48613; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 64944, vis3597.

References: (1) Malinko, S.V. (1961) New boron minerals – uralborite and pentahydroborite. Zap. Vses. Mineral. Obsch., 90, 673–681 (in Russian). (2) (1962) Amer. Mineral., 47, 1482 (abs. ref. 1). (3) Simonov, M.A., Y.K. Yegorov-Tismenko, and N.V. Belov (1977) Accurate crystal structure of uralborite Ca₂[B₄O₄(OH)₈]. Doklady Acad. Nauk SSSR, 234, 822–825 (in Russian). (4) Kusachi, I., K. Shiraga, S. Kobayashi, J. Yamakawa, and Y. Takechi (2000) Uralborite from Fuka, Okayama Prefecture, Japan. Mineral. J. (Japan), 95, 43–47.

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