Bussenite $Ba_4(Na, \square)_2(Fe^{2+}, Na)_2Ti_2(Si_2O_7)_2(CO_3)_2O_2(OH)_2(H_2O)_2F_2$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As aggregates of thin curved plates, to 5 cm.

Physical Properties: *Cleavage*: Perfect on {100}, moderate on {110} and {$\bar{1}$ 10}. *Tenacity*: Brittle. *Fracture*: Stepped. Hardness = 4 D(meas.) = 3.63(2) D(calc.) = 3.65
Macroscopically and microscopically resembles lamprophyllite.

Optical Properties: Translucent. *Color*: Yellow-brown. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (+). α = 1.671(2) β = 1.694(2) γ = 1.734(3) 2V = 71(1)°
Dispersion: Strong, $r > v$. *Pleochroism*: Strong; $X = Z$ = pale yellow, Y = brownish orange.
Orientation: $Y \approx a$, $c \wedge X \approx 5°$ in obtuse α.

Cell Data: *Space Group*: $P\bar{1}$. a = 5.399(3) b = 7.016(9) c = 16.254(14) α = 102.44(8)° β = 93.18(6)° γ = 90.10(7)° Z = 2

X-ray Powder Pattern: Mount Kukisvumchorr, Khibiny massif, Kola Peninsula, Russia.
3.186 (100), 2.738 (62), 3.910 (44), 3.055 (38), 2.695 (32), 2.613 (32), 2.797 (29)

Chemistry:

	(1)
Na_2O	8.98
K_2O	0.65
CaO	1.56
SrO	6.78
BaO	28.79
FeO	6.77
MnO	4.68
SiO_2	18.01
TiO_2	11.57
Nb_2O_5	1.04
H_2O	3.90
CO_2	5.76
F	2.79
-O = F	1.17
Total	100.11

(1) Mount Kukisvumchorr, Khibiny massif, Kola Peninsula, Russia; average electron microprobe analysis, H_2O by Penfield method, CO_2 calculated from total weight loss minus H_2O loss; corresponding to $(Na_{1.94}K_{0.09})_{\Sigma=2.03}(Ba_{1.25}Sr_{0.44}Ca_{0.19})_{\Sigma=1.88}(Fe^{2+}_{0.63}Mn_{0.44})_{\Sigma=1.07}(Ti_{0.97}Nb_{0.05})_{\Sigma=1.02}$ $Si_{2.00}O_{7.27}(CO_3)_{0.87}(OH)_{2.89}F_{0.98}$.

Mineral Group: Bafertisite group.

Occurrence: In a sodalite-natrolite-calcite veinlet that cuts urtite in an alkaline massif.

Association: Natrolite, sodalite, aegirine, biotite, vinogradovite, titanite, eudialyte, calcite, barytocalcite, fluorapatite, fluorite, djerfisherite, molybdenite.

Distribution: At Mount Kukisvumchorr, Khibiny alkaline massif, Kola Peninsula, Russia.

Name: Honors Russian petrologist Irina V. *Bussen* (b. 1915), specialist in the petrology and mineralogy of the Khibiny-Lovozero alkaline complex.

Type Material: A.E. Fersman Mineralogical Museum, Moscow, Russia.

References: (1) Khomyakov, A.P., Yu.P. Men'shikov, G.N. Nechelyustov, and Huyun Zhou (2001) Bussenite, $Na_2Ba_2Fe^{2+}TiSi_2O_7(CO_3)(OH)_3F$, a new mica-like titanosiicate from the Khibiny alkaline massif (Kola Peninsula). Zap. Vseross. Mineral. Obshch., 130(3), 50-55 (in Russian, English abs.). (2) (2002) Amer. Mineral., 87, 1509 (abs. ref. 1). (3) Zhou, H., R.K. Rastsvetaeva, A.P. Khomyakov, Z. Ma, and N. Shi (2002) Crystal structure of new micalike titanosilicate - bussenite, $Na_2Ba_2Fe^{2+}[TiSi_2O_7][CO_3]O(OH)(H_2O)$. Crystallogr. Rep. 47, 43-46.