Bradaczekite $NaCu_4(AsO_4)_3$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As complex crystals elongate along [$\bar{1}$ 02], to ~0.2 mm, showing at least 14 forms.

Physical Properties: *Cleavage*: None. *Tenacity*: n.d. *Fracture*: n.d. Hardness = n.d. D(meas.) = n.d. D(calc.) = 4.77(1) Nonfluorescent.

Optical Properties: Transparent. *Color*: Dark blue. *Streak*: Light blue to white. *Luster*: Adamantine. *Optical Class*: Biaxial (-). α = 1.76(1) β = 1.92(1) γ = 1.96(1) 2V(calc.) = 50° *Orientation*: $Z = b$, $X \wedge c$ = 23° in obtuse β. *Pleochroism*: Strong; X = violet-red, Y = green, Z = greenish blue.

Cell Data: *Space Group*: *C*2/*m*. a = 12.051(1) b = 12.434(1) c = 7.2662(7) β = 117.942(1)° Z = 4

X-ray Powder Pattern: Tolbachik Great fissure eruption, Kamchatka Peninsula, Russia. 3.43 (100), 3.21 (35), 2.683 (30), 2.791 (24), 3.60 (21), 2.696 (18), 2.665 (17)

Chemistry:

	(1)
Na_2O	5.17
K_2O	0.35
CuO	43.13
Zn	0.79
Fe_2O_3	0.38
As_2O_5	49.62
V_2O_5	0.13
Total	99.55

(1) Tolbachik Great fissure eruption, Kamchatka Peninsula, Russia; average electron microprobe analysis; corresponds to $(Na_{1.16}K_{0.05})_{\Sigma=1.21}(Cu_{3.74}Zn_{0.07}Fe^{3+}_{0.03})_{\Sigma=3.84}(As_{3.00}V_{0.01})_{\Sigma=3.01}O_{12}$.

Mineral Group: Alluaudite supergroup, alluaudite group.

Occurrence: Formed in a volcanic fumarole.

Association: Hematite, tenorite, lammerite, urusovite, orthoclase, johillerite.

Distribution: At the second cinder cone, North Breach of the Tolbachik Great fissure eruption, Kamchatka Peninsula, Russia.

Name: Honors crystallographer Hans *Bradaczek* (b. 1940), Free University of Berlin, Germany.

Type Material: Mining Museum of the Mining Institute, Saint Petersburg, Russia.

References: (1) Filatov, S.K., L.P. Vergasova, M.G. Gorskaya, S.V. Krivovichev, P.C. Burns, and V.V. Ananiev (2001) Bradaczekite, $NaCu_4(AsO_4)_3$, a new mineral species from the Tolbachik volcano, Kamchatka Peninsula, Russia. Can. Mineral., 39, 1115-1119. (2) (2002) Amer. Mineral., 87, 765 (abs. ref. 1). (3) Hatert, F. (2019) A new nomenclature scheme for the alluaudite supergroup. Eur. J. Mineral., 31, 807-822.