Tumchaite $Na_2ZrSi_4O_{11}·2H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m.* As tabular crystals flattened on (100), elongated along [001], to 2.5 mm. *Twinning*: Observed on (100).

Physical Properties: *Cleavage*: Perfect on (100). *Fracture*: Uneven. *Tenacity*: Brittle. Hardness = ~4.5 VHN = 365-445, 410 average (40 g load). D(meas.) = 2.78 (2) D(calc.) = 2.77 Nonfluorescent.

Optical Properties: Transparent to translucent. *Color*: Colorless to white. *Streak*: White. *Luster*: Vitreous.
Optical Class: Biaxial (-). α = 1.570(2) β = 1.588(2) γ = 1.594(2) 2V(meas.) = 60(5)° 2V(calc.) = 59.4° *Orientation*: $Y = b$, $c \wedge Z = 3°$; positive elongation.
Pleochroism: $Y = Z$ = colorless, X = greenish gray.

Cell Data: *Space Group*: $P2_1/c$. a = 9.144(4) b = 8.818(3) c = 7.537(3) β = 113.22(3)° Z = 2

X-ray Powder Pattern: Vuoriyarvi alkali-ultrabasic massif, Murmansk Region, Russia.
8.40 (10), 5.38 (9), 3.401 (9), 2.902 (9), 2.691 (9), 4.00 (8), 2.772 (7)

Chemistry:

	(1)		(1)
Na_2O	13.72	TiO_2	0.35
CaO	0.15	ZrO_2	20.41
MnO	<0.02	SnO_2	5.73
FeO	<0.02	HfO_2	0.60
Y_2O_3	<0.1	Nb_2O_5	<0.05
SiO_2	52.71	H_2O	[7.86]
		Total	101.53

(1) Vuoriyarvi alkali-ultrabasic massif, Murmansk Region, Russia; average electron microprobe analysis supplemented by IR spectroscopy, H_2O calculated from stoichiometry; corresponds to $(Na_{2.03}Ca_{0.01})(Zr_{0.76}Sn_{0.17}Ti_{0.02}Hf_{0.01})Si_{4.02}O_{11}·2H_2O$.

Occurrence: As a lens-like segregation in a core sample from a bore hole, which crosscuts veined dolomite-calcite carbonatites occurring in pyroxenites. Formed by hydrothermal alteration of carbonatite.

Association: Calcite, dolomite, a mineral of the serpentine group, pyrite.

Distribution: From the Vuoriyarvi alkali-ultrabasic massif, Murmansk region, Russia [TL].

Name: For the *Tumcha* river near the Vuoriyarvi massif.

Type Material: Gorniy Museum, St. Petersburg Mining Institute (Technical University), St. Petersburg, Russia (3123).

References: (1) Subbotin, V.V., S. Merlino, D.YU. Pushcharovsky, Y.A. Pakhomovsky, O. Ferro, A.N. Bogdanova, A.V. Voloshin, N.V. Sorokhtina, and N.V. Zubkova (2000) Tumchaite $Na_2(Zr,Sn)Si_4O_{11}·2H_2O$ - A new mineral from carbonatites of the Vuoriyarvi alkali-ultrabasic massif, Murmansk Region, Russia. Amer. Mineral., 85, 1516-1520.