Witzkeite $Na_4K_4Ca(NO_3)_2(SO_4)_4 \cdot 2H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. Crystals, to 140 μm, are elongated tabular.

Physical Properties: *Cleavage:* {001}, distinct. *Tenacity*: Brittle. *Fracture*: Uneven. Hardness = 2 D(meas.) = 2.40(2) D(calc.) = 2.403

Optical Properties: Transparent. *Color*: Colorless. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (–). α = 1.470(5) β = 1.495(5) γ = 1.510(5) 2V(meas.) = 50°-70° *Orientation*: $X = b$, $Y \approx a$, $Z = c$. *Dispersion*: Weak, $r > v$.

Cell Data: *Space Group: C*2/*c*. a = 24.902(2) b = 5.3323(4) c = 17.246(1) β = 94.281(7)° Z = 4

X-ray Powder Pattern: Punta de Lobos, Tarapacá region, ~ 90 km south of Iquique, Chile. 12.38 (100), 2.07 (54), 3.10 (24), 4.13 (19), 2.48 (12), 2.69 (9), 2.99 (7)

Chemistry:	(1)	(2)
Na_2O	12.83	14.89
K_2O	22.64	22.62
CaO	7.57	6.73
FeO	0.44	
SO_3	39.96	38.46
N_2O_5	12.7	12.97
H_2O	4.5	4.33
Total	100.64	100.00

(1) Punta de Lobos, Tarapacá region, ~ 90 km south of Iquique, Chile; average of 5 electron microprobe analyses supplemented by IR spectroscopy, H_2O, CO_2, and N_2O_5 determined by CHN analysis; corresponding to $Na_{3.40}K_{3.95}Ca_{1.11}Fe_{0.05}(NO_3)_{1.93}(SO_4)_{4.10}(H_{4.10}O_{1.81})$.
(2) $Na_4K_4Ca(NO_3)_2(SO_4)_4 \cdot 2H_2O$.

Occurrence: In the oxidation zone of a guano deposit in an arid climate.

Association: Dittmanite, nitratine.

Distribution: From the southeast slope of Punta de Lobos, Tarapacá region, ~ 90 km south of Iquique, Chile.

Name: Honors Thomas Witzke (b. 1963), a German mineralogist whose study of alteration processes and products has resulted in the discovery and description of several new minerals.

Type Material: Museum of Mineralogy, Department of Geosciences, University of Padova, Italy (MMP M10009).

References: (1) Nestola, F., F. Cámara, N.V. Chukanov, D. Atencio, J.M.V. Coutinho, R.R. Contreira Filho, and G. Färber (2012) Witzkeite: A new rare nitrate-sulphate mineral from a guano deposit at Punta de Lobos, Chile. Amer. Mineral., 97, 1783-1787.