Klöchite $(Fe^{2+}Fe^{3+})\square_2KZn_3(Si_{12}O_{30})$

Crystal Data: Hexagonal. *Point Group*: 6/*m* 2/*m* 2/*m*. As hexagonal tabular crystals flattened on {0001}, to 0.3 mm, composed of two hexagonal prisms, one hexagonal bipyramid and the basal pinacoid.

Physical Properties: *Cleavage*: None. *Tenacity*: n.d. *Fracture*: n.d. Hardness = n.d.
D(meas.) = n.d. D(calc.) = 3.016 Nonfluorescent.

Optical Properties: Translucent. *Color*: Blue. *Streak*: n.d. *Luster*: Vitreous.
Optical Class: Uniaxial (-). ω = 1.594(1) ε = 1.590(1) *Pleochroism*: *O* = deep blue, *E* = pale yellow.

Cell Data: *Space Group*: *P*6/*mcc*. *a* = 10.120(1) *c* = 14.298(3) Z = 2

X-Ray Diffraction Pattern: Klöch volcano, Bad Radkersburg district, Styria, Austria.
7.149 (100), 3.736 (70), 2.770 (68), 3.227 (67), 5.540 (43), 2.530 (43), 4.130 (40)

Chemistry:

	(1)	(2)
Li_2O	0.03	
Na_2O	1.47	
K_2O	3.18	4.05
CaO	0.25	
TiO_2	0.05	
FeO	3.46	6.17
Fe_2O_3	8.25	6.87
MgO	0.04	
MnO	1.69	
CoO	0.16	
SiO_2	62.66	61.95
NiO	0.08	
ZnO	18.56	20.97
Total	99.88	100.00

(1) Klöch volcano, Bad Radkersburg district, Styria, Austria; average electron microprobe and LA-ICP-MS analyses; corresponding to $(K_{0.78}Na_{0.22})(\square_{1.67}Na_{0.33})(Fe^{3+}_{1.19}Fe^{2+}_{0.45}Mn_{0.27}Ca_{0.04}Co_{0.02}Ni_{0.01}Mg_{0.01}Ti_{0.01})(\square_{0.25}Zn_{2.63}Fe^{2+}_{0.10}Li_{0.02})[Si_{12.00}O_{30.00}]$. (2) $K\square_2(Fe^{2+}Fe^{3+})Zn_3Si_{12}O_{30}$.

Occurrence: In vugs in a SiO_2-rich xenolith from a nepheline basanite quarry.

Association: Sanidine, quartz, diopside, fluoro-richterite, titanite, enstatite, forsterite, ilmenite, mottramite.

Distribution: From the Klöch volcano, Bad Radkersburg district, Styria, Austria.

Name: For *Klöch*, a famous location for minerals and wine in Styria, Austria.

Type Material: Mineralogy Department, Universalmuseum Joanneum, Graz, Austria (84.580).

References: (1) Bojar, H.-P., F. Walter, C. Hauzenberger, and W. Postl (2011) Klöchite, $K\square_2(Fe^{2+}Fe^{3+})Zn_3[Si_{12}O_{30}]$, a new milarite-type mineral species from the Klöch volcano, Styria, Austria. Can. Mineral., 49, 1115-1124. (2) Walter, F. (2009) Das Steirisch-Burgenländische vulkangebiet - eine quell seltener und neuer mineralarten. Der Steirische Mineralog, 23, 8-13.