Obradovicite-NaCu $[Na_2(H_2O)_{17}Cu(H_2O)_6][Mo^{6+}_8As^{5+}_2Fe^{3+}_3O_{34}(OH)_3]$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. Typically, as doubly terminated, bladed crystals, flattened on {001} and elongated parallel to [010], to ~0.1 mm. Forms include {001}, {110} and {101} with the {001} faces striated parallel to [010]. *Twinning*: None observed.

Physical Properties: *Cleavage*: None. *Tenacity*: Brittle. *Fracture*: Splintery. Hardness = ~2 D(meas.) = n.d. D(calc.) = 2.967

Optical Properties: Transparent. *Color*: Yellowish green. *Streak*: Very pale yellowish green. *Luster*: Vitreous to subadamantine.
Optical Class: Biaxial (-). $\alpha = 1.790(3)$ $\beta = 1.798(3)$ γ(calc.)= 1.805 2V(meas.) = 86(5)º
Pleochroism: None. *Orientation*: $X = a$; $Y = b$; $Z = c$. *Dispersion*: Strong, $r > v$.

Cell Data: *Space Group*: *Pnmb*. $a = 14.872(4)$ $b = 11.091(3)$ $c = 15.032(4)$ $Z = 2$

X-ray Powder Pattern: Chuquicamata mine, Antofagasta, Chile.
8.936 (100), 10.483 (43), 2.989 (29), 3.226 (25), 2.980 (25), 2.598 (23), 2.773 (22)

Chemistry:

	(1)
Na_2O	2.97
K_2O	3.66
CaO	0.16
CuO	2.07
Fe_2O_3	11.64
Al_2O_3	0.01
SiO_2	0.02
P_2O_5	0.23
As_2O_5	9.16
MoO_3	51.97
H_2O	[18.11]
Total	100.00

(1) Chuquicamata mine, Antofagasta, Chile; normalized electron microprobe analysis, H_2O calculated; corresponds to $[(Na_{1.99}K_{1.72})_{\Sigma=3.71}(H_2O)_{15.29}(Cu2^{+}_{0.58}Fe^{3+}_{0.23}Na_{0.13}Ca_{0.06})_{\Sigma=1.00}(H_2O)_6]$ $[Mo_8(As_{1.77}P_{0.07}Si_{0.01})_{\Sigma=1.85}Fe^{3+}_{3.00}O_{35.05}(OH)_{1.95}]$.

Mineral Group: Betpakdalite supergroup, obradovicite group.

Occurrence: A rare secondary mineral in the oxidized zone of a Cu-Mo porphyry deposit, in sugary aggregates intermixed with fragmented quartz crystals embedded in a porous boxwork.

Association: Obradovicite-KCu, quartz, hematite, goethite.

Distribution: From Chuquicamata, Antofagasta, Chile [TL].

Name: Honors Martin T. *Obradovic*, who provided the studied material. Two suffixes correspond to the dominant cations in the two different types of non-framework cation sites.

Type Material: Colorado School of Mines, Golden, Colorado (CSM 86-496); National Museum of Natural History, Washington, D.C. (164185), USA.

References: (1) Finney, J.J., S.A. Williams, and R.D. Hamilton (1986) Obradovicite, a new complex arsenate-molybdate from Chuquicamata, Chile. Mineral. Mag., 50, 283-284. (2) (1987) Amer. Mineral., 72, 1026 (abs. ref. 1). (3) Kampf, A.R., S.J. Mills, M.S. Rumsey, M. Dini, W.D. Birch, J. Spratt, J.J. Pluth, I.M. Steele, R.A. Jenkins, and W.W. Pinch (2012) The heteropolymolybdate family: structural relations, nomenclature scheme and new species. Mineral. Mag., 76, 1175-1207.