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

Crystal Data: Monoclinic. *Point Group*: 2/*m.*

Physical Properties: *Cleavage*: n.d. *Tenacity*: n.d. *Fracture*: n.d. Hardness = n.d.
D(meas.) = 2.02 D(calc.) = 2.892

Optical Properties: Translucent. *Color*: Lemon yellow. *Streak*: n.d. *Luster*: Dull.
Optical Class: Biaxial. α = 1.792 β = n.d. γ = 1.81 2V(meas.) = n.d. 2V(calc.) = n.d.
Pleochroism: *X* = pale yellow, *Z* = yellow. *Absorption*: *Z* > *X*. *Orientation*: *Z* ∧ elongation = 38º.

Cell Data: *Space Group*: *C*2/*m.* *a* = 19.41(3) *b* = 11.12(4) *c* = 15.26(3) β = 131.13(7)º Z = 2

X-ray Powder Pattern: Kyzylsai Mo-U deposit, Chu-Ili mountains, Kazakhstan.
8.80 (100), 3.615 (90), 9.64 (80), 2.034 (80), 1.723 (80), 2.952 (70), 2.096 (70)

Chemistry:

	(1)	(2)
Na_2O	3.14	1.58
K_2O	0.20	0.30
CaO	4.23	3.64
CuO	n.d.	0.06
MgO	0.22	n.d.
Fe_2O_3	11.25	10.28
Al_2O_3	0.40	0.64
SiO_2	0.20	0.11
As_2O_5	13.93	9.38
MoO_3	50.22	53.29
H_2O	16.65	[20.83]
Total	100.44	100.00

(1) Kyzylsai Mo-U deposit, Chu-Ili mountains, Kazakhstan; wet chemical and DTA analyses.
(2) Do., normalized electron microprobe analysis, H_2O calculated for stoichiometry; corresponding to $[Na_{1.10}Ca_{0.47}K_{0.14}(H_2O)_{17.29}Ca_{0.93}Al_{0.05}Cu^{2+}_{0.02}(H_2O)_6][Mo^{6+}_8As^{5+}_{1.88}Fe^{3+}_{2.78}Al_{0.22}O_{33.63}(OH)_{3.37}]$.

Mineral Group: Betpakdalite supergroup, betpakdalite group.

Occurrence: n.d.

Association: n.d.

Distribution: Kyzylsai Mo-U deposit, Chu-Ili mountains, Kazakhstan.

Name: For the Bet-Pak-Dal Desert, Kazakhstan. Two suffixes correspond to the dominant cations in the two different types of non-framework cation sites.

Type Material: A.E. Fersman Mineralogical Museum, Moscow, Russia (47275).

References: (1) Skvortsova, K.V., Sidorenko, G.A., Nesterova, Y.S., Arapova, G.A., Dara, A.D. and Rybakova, L.I. (1971) Sodium betpakdalite and conditions of its formation. Zapiski Vsesoyuzhogo Mineralogicheckogo Obshchestra, 100, 603-611 [in Russian] [betpakdalite-NaCa]. (2) 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(5), 1175-1207.