

Betpakdalite-CaMg**Crystal Data:** Monoclinic. *Point Group:* 2/m. As pseudo-octahedra, to ~1 mm.*Twinning:* Uncommon as contact twins on (001) by rotation of 120° about [102] and as penetration twins by rotation of 120° about [102].**Physical Properties:** *Cleavage:* {001}, perfect. *Tenacity:* Brittle. *Fracture:* Irregular.

Hardness = ~3.5 D(meas.) = 2.98(4) D(calc.) = 2.944

Optical Properties: Transparent. *Color:* Yellow. *Streak:* Colorless to very pale yellow.*Luster:* Vitreous to subadamantine.*Optical Class:* Biaxial (+). *Pleochroism:* None. *Orientation:* Y = b; Z ≈ c. *Dispersion:* r < v, strong. α = 1.818(3) β = 1.824(3) γ = 1.846(3) 2V(meas.) = 55(2)° 2V(calc.) = 55.7°**Cell Data:** *Space Group:* C2/m. a = 19.5336(7) b = 11.0637(4) c = 15.2559(11) β = 131.528(9)° Z=2**X-ray Powder Pattern:** Tsumeb, Namibia.

8.971 (100), 2.965 (44), 2.817 (35), 7.341 (34), 3.656 (33), 2.662 (31), 3.143 (26)

Chemistry:	(1)	(2)	(1)	(2)
MoO ₃	52.9	52.42	CaO	5.3
As ₂ O ₅	10.0	10.46	H ₂ O	[19.4] 19.27
Fe ₂ O ₃	11.2	10.90	Total	[100.6] 100.00
MgO	1.8	1.84		

(1) Tsumeb, Namibia; by electron microprobe, total Fe as Fe₂O₃, H₂O calculated for stoichiometry; corresponding to [Ca_{2.1}(H₂O)₁₇Mg_{1.0}(H₂O)₆][Mo⁶⁺₈As⁵⁺_{1.9}Fe³⁺_{3.1}O₃₆(OH)].(2) [Ca₂(H₂O)₁₇Mg(H₂O)₆][Mo⁶⁺₈As⁵⁺₂Fe³⁺₃O₃₆(OH)].**Mineral Group:** Betpakdalite supergroup, betpakdalite group.**Occurrence:** In a deep oxidation zone of a dolostone-hosted hydrothermal polymetallic ore deposit, formed by alteration of As, Fe and Mo sulfides by solutions rich in Ca and Mg (Tsumeb, Namibia).**Association:** Scorodite, djurleite, powellite, adamite, gerdtrammelite, wulfenite, hidalgoite, chalcocite, digenite, kaolinite, quartz, hematite (Tsumeb, Namibia).**Distribution:** On the 35th level of the Tsumeb mine, Namibia.**Name:** For the original occurrence in 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:** Natural History Museum of Los Angeles County, Los Angeles, California, USA, (63327 and 63328).**References:** (1) Kampf, A.R. and S.J. Mills (2011) Betpakdalite-CaMg, IMA 2011-034. CNMNC Newsletter No. 10, Mineral. Mag., 75, 2556 [betpakdalite-CaMg confirmed]. (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. (3) Schmetzer, K., B. Nuber, and G. Tremmel (1984) Betpakdalit aus Tsumeb, Namibia: Mineralogie, Kristallchemie und Struktur. Neues Jahrb. Mineral., Monatsh., 393-403 (in German with English abs.). (4) Cooper, M.A. and F.C. Hawthorne (1999) The crystal structure of betpakdalite and a new chemical formula Mg(H₂O)₆Ca₂(H₂O)₁₃[Mo⁶⁺₈As⁵⁺₂Fe³⁺₃O₃₆(OH)](H₂O)₄. Can. Mineral., 37, 61-66 [betpakdalite-CaMg].