

Dickinsonite-(KMnNa)**K(NaMn)CaNa₃AlMn₁₃(PO₄)₁₂(OH)₂**

Crystal Data: Monoclinic. *Point Group:* *m*. As mica-like platelets to a few hundred μm .

Physical Properties: *Cleavage:* On {001}. *Tenacity:* Brittle. *Fracture:* n.d. Hardness = 3.5-4 D(meas.) = n.d. D(calc.) = 3.496 Nonfluorescent.

Optical Properties: Transparent. *Color:* Vivid green. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (+). $\alpha = 1.658$ $\beta = 1.662$ $\gamma = 1.671$ $2V(\text{calc.}) = 68^\circ$ *Dispersion:* $r \gg v$. *Orientation:* $X = b$, $Y \wedge c = 15^\circ$. *Pleochroism:* Very weak, $X = \text{pale olive-green}$, $Y = \text{paler olive-green}$, $Z = \text{very pale yellow-green}$. *Absorption:* $X > Y > Z$.

Cell Data: *Space Group:* *Cc*. $a = 16.6900(9)$ $b = 10.1013(5)$ $c = 24.8752(13)$ $\beta = 105.616(2)^\circ$ $Z = 4$

X-Ray Diffraction Pattern: Calculated pattern.
3.06 (100), 2.73 (89), 3.245 (33), 2.778 (29), 5.972 (27), 2.868 (27), 2.788 (27)

Chemistry:	(1)	(2)		(1)	(2)
P ₂ O ₅	[39.01]	38.78	K ₂ O	1.07	2.20
Al ₂ O ₃	2.12	2.38	CaO	1.31	2.62
FeO	12.52		SrO	0.25	
MnO	31.47	46.39	BaO	0.04	
ZnO	0.02		PbO	0.09	
MgO	0.08		F	0.02	
Li ₂ O _{LAM}	0.213		H ₂ O	[0.90]	0.84
Na ₂ O	8.19	5.79	<u>-O = F</u>	<u>0.01</u>	
			Total	97.33	100.00

(1) Branchville, Fairfield County, Connecticut, USA; average electron microprobe analysis, H₂O and P₂O₅ calculated, total includes SiO₂ = 0.01, TiO₂ = 0.01; corresponds to K_{0.50}Na_{5.78}(Ca_{0.51}Sr_{0.05}Ba_{0.01}Pb_{0.01}) $\Sigma=0.58$ (Mn²⁺_{9.70}Fe²⁺_{3.72}Li_{0.31}Mg_{0.06}Zn_{0.01}) $\Sigma=13.80$ (Al_{0.91}Fe³⁺_{0.09}Ti_{0.01}) $\Sigma=1.00$ [(OH)_{1.97}F_{0.03}] $\Sigma=2.00$ [(P_{12.02}Si_{0.01}) $\Sigma=12.03$ O₄₇(OH)_{0.21}]. (2) K(NaMn)CaNa₃AlMn₁₃(PO₄)₁₂(OH)₂.

Polymorphism & Series: Forms a series with arrojadite.

Mineral Group: Arrojadite group. A₂B₂CaNa_{2+x}M₁₃Al(PO₄)₁₁(PO₃OH_{1-x})W₂.

Occurrence: In nodular masses in albitic granite pegmatite.

Association: Quartz, eosphorite, triploidite, lithiophilite.

Distribution: Branchville, Fairfield County, Connecticut, USA [TL].

Name: *Dickinsonite* indicates a member of the group with Mn²⁺ dominant at the *M* site; two suffixes indicate the dominant cation of the dominant valence state at the *A* and *B* sites. Honors the Reverend John William *Dickinson* (1835-1899), Redding, Connecticut, USA, an early collector of Branchville minerals.

Type Material: Mineral Museum, School of Mines, Paris, France (4861).

References: (1) Chopin, C., R. Oberti, and F. Cámara (2006) The arrojadite enigma: II. Compositional space, new members, and nomenclature of the group. *Amer. Mineral.*, 91, 1260-1270. (2) Cámara, F., R. Oberti, C. Chopin, and O. Medenbach (2006) The arrojadite enigma: I. A new formula and a new model for the arrojadite structure. *Amer. Mineral.*, 91, 1249-1259.