

Kambaldaite

NaNi₄(CO₃)₃(OH)₃•3H₂O

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Crystal Data: Hexagonal. *Point Group:* 6. As hexagonal prisms {10 $\bar{1}$ 0}, terminated by {0001} and {11 $\bar{2}$ 1}, to about 50 μ m, as individual crystals or in radiating spherical nodules; in cryptocrystalline veins, concretionary, chalky, massive.

Physical Properties: Hardness = \sim 3 D(meas.) = 3.18 D(calc.) = 3.193

Optical Properties: Transparent to translucent. *Color:* Bright grass-green to emerald-green, crystals may be zoned with a clear core and translucent margins; pale green if massive.

Streak: Pale green. *Luster:* Silky on fractures.

Optical Class: Uniaxial (+). *Pleochroism:* *O* = pale green; *E* = emerald-green. ω = 1.65 ϵ = 1.69

Cell Data: *Space Group:* *P*6₃. *a* = 10.340(3) *c* = 6.097(2) *Z* = 2

X-ray Powder Pattern: Kambalda, Western Australia.

9.03 (10), 4.490 (9), 3.613 (4), 2.681 (4), 2.584 (4), 2.519 (4), 2.263 (4)

Chemistry:	(1)	(2)
SO ₃	0.3	
SiO ₂	0.2	
CO ₂	27.5	24.32
Al ₂ O ₃	0.4	
NiO	52.9	55.04
MgO	1.3	
Na ₂ O	3.0	5.71
H ₂ O	12.5	14.93
Total	98.1	100.00

(1) Kambalda, Western Australia; by electron microprobe, C and H by microanalysis; corresponds to Na_{0.52}(Ni_{3.90}Mg_{0.18})_{Σ=4.08}[(C_{1.15}Al_{0.01}Si_{0.01})_{Σ=1.17}O_{3.46}]₃(OH)_{1.98}•2.84H₂O.

(2) NaNi₄(CO₃)₃(OH)₃•3H₂O.

Occurrence: A secondary mineral in goethitic residues formed by oxidation of violarite–pyrite in the presence of wallrock carbonates and saline groundwater (Kambalda, Western Australia).

Association: Gaspéite, reevesite, aragonite, pyrite, goethite (Kambalda, Western Australia).

Distribution: In Australia, from the Otter Shoot, Kambalda, 56 km south of Kalgoorlie, and in the 132 North nickel mine, 4 km southwest of Widgiemooltha, Western Australia.

Name: For Kambalda, Western Australia, its locality of discovery.

Type Material: Western Australian Museum, Perth, M.62.1991; Museum Victoria, Melbourne, M37494; Australian Museum, Sydney, Australia, D48054; The Natural History Museum, London, England, 1985.497; National Museum of Natural History, Washington, D.C., USA, 162706.

References: (1) Nickel, E.H. and B.W. Robinson (1985) Kambaldaite—a new hydrated Ni–Na carbonate mineral from Kambalda, Western Australia. *Amer. Mineral.*, 70, 419–422.

(2) Engelhardt, L.M., S.R. Hall, and A.H. White (1985) Crystal structure of kambaldaite, Na₂Ni₈(CO₃)₆•6H₂O. *Amer. Mineral.*, 70, 423–427.