Carrboydite $(Ni, Al)_9(SO_4)_2(OH)_{18}\cdot 10H_2O(?)$

Crystal Data: Hexagonal. *Point Group:* n.d. As spherical felted aggregates of platy crystals, to 1 mm, and as amorphous-appearing coatings; massive in thin veins and fracture fillings.

Physical Properties: Hardness = n.d. D(meas.) = 2.50(5), on porous impure material. D(calc.) = 2.692

Optical Properties: Translucent. *Luster:* Dull to waxy. *Color:* Yellowish green, greenish yellow, blue-green, pale green, greenish blue; pale blue-green in transmitted light. *Optical Class:* Uniaxial (–), may be biaxial (–). *Orientation:* Length-slow. $\omega = \sim 1.56$ $\epsilon = \sim 1.54$ 2V(meas.) = Small.

Cell Data: *Space Group:* n.d. $a = 9.14$ $c = 10.34$ Z = [1]

X-ray Powder Pattern: Carr Boyd Rocks mine, Australia.
10.5 (vs), 5.25 (s), 2.55 (ms), 3.48 (m), 1.51 (m), 2.62 (w), 2.36 (wb)

Chemistry:

	(1)
SO_3	14.5
CO_2	1.65
SiO_2	2.6
Al_2O_3	17.9
NiO	38.2
CuO	2.5
H_2O	20.55
Total	97.9

(1) Carr Boyd Rocks mine, Australia; by electron microprobe, C and H by microanalysis, here recalculated to oxides; after deduction of CO_2, SiO_2, and CuO, corresponds to $(Ni_{5.7}Al_{3.9})_{\Sigma=9.6}(SO_4)_{2.0}(OH)_{19.1}\cdot 3.0H_2O$.

Occurrence: A rare secondary mineral in the oxidized zone of nickel sulfide deposits.

Association: Malachite, azurite, paratacamite, brochantite, glaukosphaerite, takovite, nickeloan magnesite, chalconatronite, georgeite, halloysite, chabazite, gypsum, epsomite (Carr Boyd Rocks mine, Western Australia).

Distribution: In Australia, from the Carr Boyd Rocks nickel mine, Yerilla district, 80 km north-northeast of Kalgoorlie, and at the 132 North nickel mine, 4 km southwest of Widgiemooltha, Western Australia.

Name: For the Carr Boyd Rocks mine, Australia, the first known locality.

Type Material: Western Australian Museum, Perth, Australia, M.74.1991; National Museum of Natural History, Washington, D.C., USA, 135930.

References: (1) Nickel, E.H. and R.M. Clarke (1976) Carrboydite, a hydrated sulfate of nickel and aluminum: a new mineral from Western Australia. Amer. Mineral., 61, 366–372.