Hydrombobomkulite $(Ni, Cu)Al_4[(NO_3)_2, SO_4](OH)_{12} \cdot 13{-}14H_2O$

Crystal Data: [Monoclinic.] (by analogy to mbobomkulite). *Point Group:* n.d. As powdery nodules and microcrystalline coatings; on dehydration exfoliates into "tiny" hexagonal plates.

Physical Properties: *Cleavage:* [On {001}, perfect.] *Tenacity:* Friable in aggregates. Hardness = ["Very soft".] D(meas.) = n.d. D(calc.) = n.d. Dehydrates readily to mbobomkulite.

Optical Properties: Translucent. *Color:* Blue; colorless in transmitted light. *Optical Class:* [Biaxial, weakly birefringent.] α = n.d. β = n.d. γ = n.d. 2V(meas.) = n.d.

Cell Data: *Space Group:* n.d. $a = 10.145$ $b = 17.155$ $c = 20.870$ $\beta = 90.55°$ Z = 8

X-ray Powder Pattern: Mbobo Mkulu Cave, South Africa.
10.45 (100), 5.229 (50), 3.485 (30), 2.489 (15), 6.233 (10), 4.899 (10), 4.172 (10)

Chemistry: (1) Mbobo Mkulu Cave, South Africa; desiccation of hydrombobomkulite with 32.10% weight loss of H_2O, then identity of X-ray pattern with that of mbobomkulite establishes the formula.

Occurrence: By the interaction of solutions of nickel sulfate from weathering Cu–Ni-bearing sulfides with aluminosilicate minerals and nitrate derived from bat guano (Mbobo Mkulu Cave, South Africa); in a sedimentary U–V deposit (Jomac mine, Utah, USA).

Association: Allophane, mbobomkulite, chalcoalumite (Mbobo Mkulu Cave, South Africa); oswaldpeetersite, cuprite, antlerite, goethite, lepidocrocite, mbobomkulite, sklodowskite, gypsum (Jomac mine, Utah, USA).

Distribution: From the Mbobo Mkulu Cave, near Ngodwana, Eastern Transvaal, South Africa. At the Jomac mine, White Canyon district, San Juan Co., Utah, USA.

Name: As the hydrated equivalent of *mbobomkulite*.

Type Material: Museum of the Geological Survey, Pretoria, South Africa.

References: (1) Martini, J.E.J. (1980) Mbobomkulite, hydrombobomkulite and nickelalumite, new minerals from Mbobo Mkulu Cave, Eastern Transvaal. Ann. Geol. Surv. South Africa, 14(2), 1–10. (2) (1982) Amer. Mineral., 67, 415–416 (abs. ref. 1).