Nordstrandite $Al(OH)_3$

Crystal Data: Triclinic. *Point Group:* 1. Thick tabular crystals, rhombic or blocky, to 2 mm; less commonly acicular; in radiating clusters, polycrystalline aggregates, which may be tubular, or in pellets.

Physical Properties: *Cleavage:* Perfect on {110}. Hardness = 3 D(meas.) = 2.41–2.43 D(calc.) = [2.45]

Optical Properties: Transparent to opaque. *Color:* Nearly colorless, white, cream; coral-pink to reddish brown with included goethite, may be zoned. *Luster:* Vitreous, pearly on cleavages. *Optical Class:* Biaxial (+). *Orientation:* $Z \wedge c \simeq 32°$. *Dispersion:* $r < v$, moderate. $\alpha = 1.580$ $\beta = 1.583$ $\gamma = 1.596$–1.613 2V(meas.) = 18°–24° 2V(calc.) = 10°–22°

Cell Data: *Space Group:* $P1$. $a = 6.125$–6.167 $b = 6.923$–6.936 $c = 5.074$–5.082 $\alpha = 95.62°-95.93°$ $\beta = 98.62°-99.08°$ $\gamma = 83.22°-83.53°$ Z = 4

X-ray Powder Pattern: Guam.
4.789 (100), 2.263 (15), 4.322 (12), 4.207 (10), 2.392 (9), 2.016 (8), 1.9008 (8)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO_2	4.14	0.06		Na_2O		0.01	
Al_2O_3	63.97	65.6	65.36	H_2O^+	29.05	[34.33]	34.64
Fe_2O_3	0.25			H_2O^-	1.59		
CaO		0.00		Total	99.00	[100.00]	100.00

(1) Guam. (2) Mont Saint-Hilaire, Canada; by electron microprobe, H_2O by difference. (3) $Al(OH)_3$.

Polymorphism & Series: Polymorphous with bayerite, doyleite, and gibbsite.

Occurrence: Commonly in residual soils derived from limestones; in dolomitic oil shale, marine siltstone, chalk; in pegmatite, miarolitic cavities, and xenoliths in nepheline syenites.

Association: Quartz, kaolinite, diaspore, goethite (Gunong Kapor, Borneo); natrolite, tetranatrolite, analcime, sodalite, albite, microcline, dawsonite (Mont Saint-Hilaire, Canada).

Distribution: On Gunong Kapor, near Bau, western Sarawak, Borneo, Malaysia. On the Mt. Alifan-Mt. Lamlan ridge, south Guam. From Narssârssuk, Greenland. In Canada, at Mont Saint-Hilaire, and in the Francon quarry, Montreal Island, Montreal, Quebec; from the Princess sodalite mine, Bancroft, Ontario. In the Green River Formation, Rio Blanco Co., Colorado, USA. From Newhaven, East Sussex, England. At the Bellerberg volcano, two km north of Mayen, Eifel district, Germany. From Stradnerkogel, south of Wilhelmsdorf, Styria, Austria. At Terlan, Trentino-Alto Adige, Italy. From Ajatskoe, Kazakhstan. In the Khibiny massif, Kola Peninsula, and the Listvennoye deposit, Yenisei Ridge, Siberia, Russia. Additional localities are increasingly becoming known.

Name: For Robert A. Van Nordstrand, Sinclair Research Laboratories, Harvey, Illinois, USA, who synthesized the compound, later named for him, then transferred to the natural mineral.

Type Material: Royal Ontario Museum, Toronto, Canada, M145608; Harvard University, Cambridge, Massachusetts, 108353; National Museum of Natural History, Washington, D.C., USA, 117275, 145608.

References: (1) Wall, J.R.D., E.B. Wolfenden, E.H. Beard, and T. Deans (1962) Nordstrandite in soil from West Sarawak, Borneo. Nature, 196, 264–265. (2) Hathaway, J.C. and S.O. Schlanger (1962) Nordstrandite from Guam. Nature, 196, 265–266. (3) (1963) Amer. Mineral., 48, 214–215 (abs. refs. 1 and 2). (4) Saalfeld, H. and O. Jarchow (1968) Die Kristallstruktur von Nordstrandite, $Al(OH)_3$. Neues Jahrb. Mineral., Abh., 109, 185–191 (in German with English abs.). (5) Chao, G.Y. and J. Baker (1982) Nordstrandite from Mont St-Hilaire, Quebec. Can. Mineral., 20, 77–85.