Donnayite-(Y) $NaCaSr_3Y(CO_3)_6 \cdot 3H_2O$

Crystal Data: Triclinic, pseudohexagonal, and hexagonal. *Point Group:* 1 or $3m$. As platy, tabular, saucer-shaped, columnar, barrel-shaped, or wedge-shaped pseudohexagonal crystals, to 1 cm; also as hemimorphic pyramidal crystals, terminated by {001}; as parallel crystal aggregates; as syntactic intergrowths with related minerals; as irregular grains. *Twinning:* Common by 120° rotation around [103] and reflection on {010}, {30$\overline{1}$} or {$\overline{33}$1}.

Physical Properties: *Cleavage:* On {001}, fair to imperfect. Hardness = ∼3
D(meas.) = 3.30(1) D(calc.) = 3.266 (triclinic); 3.44(3) (hexagonal).

Optical Properties: Transparent to opaque. *Color:* Colorless, pale yellow to yellow, white, gray, commonly radially zoned. *Streak:* White. *Luster:* Vitreous.
Optical Class: Biaxial (–). $\alpha = 1.551$–1.561 $\beta = 1.646(2)$ $\gamma = 1.652(2)$ 2V(meas.) = 0°–30°

Cell Data: *Space Group:* $P1$ with $a = 8.993(2)$ $b = 8.985(2)$ $c = 6.780(2)$ $\alpha = 116.25(2)°$ $\beta = 102.76(2)°$ $\gamma = 60.00(1)°$ Z = 1, or *Space Group:* $R3m$ with $a = 5.211(1)$ $c = 18.57(7)$ Z = 3

X-ray Powder Pattern: Mont Saint-Hilaire, Canada.
2.839 (10), 4.368 (7), 6.103 (4), 2.598 (4), 3.209 (3), 2.038 (3), 2.018 (3)

Chemistry:	(1)	(2)		(1)	(2)		(1)	(2)
CO_2	[30.98]	[29.94]	Nd_2O_3	1.83	2.70	CaO	5.75	2.62
Y_2O_3	13.1	9.13	Gd_2O_3		1.45	SrO	35.8	23.73
La_2O_3	0.45	5.17	Dy_2O_3		1.55	BaO	0.85	1.46
Ce_2O_3		10.33	Er_2O_3		0.87	Na_2O	3.37	3.87
Pr_2O_3		0.69	Yb_2O_3		0.36	H_2O	[6.34]	[6.13]
						Total	[98.47]	[100.00]

(1) Mont Saint-Hilaire, Canada; by electron microprobe, CO_2 and H_2O calculated for stoichiometry by analogy to weloganite; corresponds to $Na_{0.93}(Ca_{0.87}Nd_{0.09}La_{0.03})_{\Sigma=0.99}(Sr_{2.95}Ba_{0.05})_{\Sigma=3.00}Y_{0.99}(CO_3)_6 \cdot 3H_2O$. (2) Khibiny massif, Kola Peninsula, Russia; by electron microprobe, CO_2 and H_2O calculated for stoichiometry; corresponds to $Sr_{2.02}Na_{1.10}(Y_{0.72}Ce_{0.56}Ca_{0.42}La_{0.28}Nd_{0.14}Ba_{0.08}Dy_{0.07}Gd_{0.07}Pr_{0.04}Er_{0.04}Yb_{0.02})_{\Sigma=2.44}(CO_3)_6 \cdot 3H_2O$.

Polymorphism & Series: Polytypes T and R.

Occurrence: In pegmatite dikes, miarolitic cavities, and interstices in nepheline syenite in an alkaline complex (Mont Saint-Hilaire, Canada).

Association: Ewaldite, mckelveyite-(Y), synchysite, gaidonnayite, arfvedsonite, aegirine, calcite, sphalerite, catapleiite, microcline, analcime, natrolite, "chlorite" (Mont Saint-Hilaire, Canada).

Distribution: In Canada, from Mont Saint-Hilaire, and near Saint-Amable, Quebec. In Russia, from Mt. Kukisvumchorr, Khibiny massif, Kola Peninsula, and at the Vishnevogorsk complex, Vishnevy-Ilmen Mountains, Southern Ural Mountains.

Name: Honors Dr. Joseph Désiré Hubert Donnay (1902–1994), Belgian–American–Canadian crystallographer and his wife Dr. Gabrielle Donnay (1920–1987), American–Canadian mineralogist, Johns Hopkins University, Baltimore, Maryland, USA and McGill University, Montreal, Canada, for their contributions to mineralogy and crystallography.

Type Material: Canadian Museum of Nature, Ottawa, 39394–39396; Royal Ontario Museum, Toronto, Canada, M35222, M35544; National Museum of Natural History, Washington, D.C., USA, 144522, 147191.

References: (1) Chao, G.Y., P.R. Mainwaring, and J. Baker (1978) Donnayite, $NaCaSr_3Y(CO_3)_6 \cdot 3H_2O$, a new mineral from Mont St-Hilaire, Québec. Can. Mineral., 16, 335–340. (2) (1979) Amer. Mineral., 64, 653–654 (abs. ref. 1). (3) Trinh Thi Le Thu, E.A. Pobedimskaya, T.N. Nadezhina, and A.P. Khomyakov (1992) Polymorphism of donnayite $(Na, TR)Sr(CO_3)_2 \cdot H_2O$. Moscow University Geol. Bull., 47, 69–78 (in Russian). (4) Khomyakov, A.P. (1995) Mineralogy of hyperagpaitic alkaline rocks. Clarendon Press, Oxford, 82–83, 86–87.