## Doyleite $Al(OH)_3$



**Crystal Data:** Triclinic. *Point Group:* $\overline{1}$ (probable) or 1. As rosettes of crystals, to 0.6 mm, tabular on {010}, showing forms {101}, {10$\overline{1}$}, and less commonly {100} and {001}, rectangular or square in outline; also finely granular and as porcelaneous coatings.

**Physical Properties:** *Cleavage:* {010}, perfect; {100}, fair. *Tenacity:* Flexible. Hardness = 2.5–3 D(meas.) = 2.48(1) D(calc.) = 2.482

**Optical Properties:** Transparent to opaque. *Color:* Colorless, white, creamy, bluish white. *Streak:* White. *Luster:* Vitreous to pearly if colorless; otherwise dull. *Optical Class:* Biaxial (+). *Orientation:* $X$ (90°,41°); $Y$ (240°,53°); $Z$ (343°,74°) [with $c$ (0°,0°) and $b^*$ (0°,90°) using ($\phi$,$\rho$)]. *Dispersion:* $r > v$, moderately strong. $\alpha = 1.545(1)$ $\beta = 1.553(1)$ $\gamma = 1.566(1)$ 2V(meas.) = 77° 2V(calc.) = 76.8°

**Cell Data:** *Space Group:* $P\overline{1}$ (probable), or $P1$. $a = 5.002(1)$ $b = 5.175(1)$ $c = 4.980(2)$ $\alpha = 97.50(1)°$ $\beta = 118.60(1)°$ $\gamma = 104.74(1)°$ Z = 2

**X-ray Powder Pattern:** Mont Saint-Hilaire, Canada; minor preferred orientation. 4.794 (100), 2.360 (40), 1.972 (30), 1.857 (30), 1.842 (30), 4.296 (20), 4.182 (20)

**Chemistry:**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $SiO_2$ | | 0.03 | 3.22 | |
| $Al_2O_3$ | 65.2 | 63.7 | 59.6 | 65.36 |
| FeO | | 0.14 | 0.08 | |
| MgO | | | 0.96 | |
| CaO | 0.48 | | 0.23 | |
| $Na_2O$ | | 0.09 | 0.35 | |
| $H_2O$ | 35.76 | 35.76 | [35.56] | 34.64 |
| Total | 101.44 | 99.72 | [100.00] | 100.00 |

(1) Mont Saint-Hilaire, Canada; $H_2O$ by TGA, $(OH)^{1-}$ confirmed by IR. (2) Do.; by electron microprobe, $H_2O$ from (1). (3) Francon quarry, Canada; by electron microprobe, average of four analyses, $H_2O$ by difference. (4) $Al(OH)_3$.

**Polymorphism & Series:** Polymorphous with bayerite, gibbsite, and nordstrandite.

**Occurrence:** A late-stage hydrothermal mineral lining vugs in veins in nepheline syenite associated with an intrusive alkalic gabbro-syenite complex (Mont Saint-Hilaire, Canada); in vugs within silicocarbonatite sills intruding limestones (Francon quarry, Canada); in miarolitic cavities in a nepheline syenite sill (near Saint-Amable, Canada).

**Association:** Calcite, albite, pyrite (Mont Saint-Hilaire, Canada); weloganite, calcite, quartz, albite, pyrite, cryolite, strontianite, dresserite, dawsonite, fluorite, analcime (Francon quarry, Canada); microcline, eudialyte, yofortierite, astrophyllite, serandite, aegirine (near Saint-Amable, Canada).

**Distribution:** Found at Mont Saint-Hilaire, in the Francon quarry, Montreal Island, Montreal, and near Saint-Amable, Quebec, Canada.

**Name:** Honors Canadian physician E.J. Doyle, of Ottawa, Canada, who found the mineral at Mont Saint-Hilaire, Canada.

**Type Material:** Canadian Museum of Nature, Ottawa, 48932; Canadian Geological Survey, Ottawa; Royal Ontario Museum, Toronto, Canada, M41025; National Museum of Natural History, Washington, D.C., USA, 162728.

**References:** (1) Chao, G.Y., J. Baker, A.P. Sabina, and A.C. Roberts (1985) Doyleite, a new polymorph of $Al(OH)_3$, and its relationship to bayerite, gibbsite and nordstrandite. Can. Mineral., 23, 21–28. (2) (1986) Amer. Mineral., 71, 845 (abs. ref. 1).