## Paranatrolite $Na_2Al_2Si_3O_{10}•3H_2O$

**Crystal Data:** Monoclinic; pseudo-orthorhombic. *Point Group: m*. As radial fibrous, sheaflike, parallel columnar crystal aggregates, to 5 mm; as epitaxial overgrowths on natrolite, or crusts on other minerals; in veinlets, massive.

**Physical Properties:** *Cleavage:* None. *Fracture:* Conchoidal. Hardness = 5-5.5
D(meas.) = 2.21-2.29 D(calc.) = 2.20

**Optical Properties:** Transparent. *Color:* Colorless. *Luster:* Vitreous.
*Optical Class*: Biaxial (-). $\alpha$ = 1.493(2) $\beta$ = 1.499(2) $\gamma$ = 1.505(2) 2V(meas.) = 0°-10°

**Cell Data:** *Space Group: Cc*. $a$ = 18.971(4) $b$ = 19.204(3) $c$ = 6.5952(12) $\beta$ = 91.601(18)°
$Z$ = 8

**X-ray Powder Pattern:** Mont Saint-Hilaire, Canada.
2.94 (100), 5.92 (60), 4.44 (40), 4.78 (30), 6.76 (20), 3.26 (15), 3.12 (15)

**Chemistry:**

| | (1) |
|---|---|
| $SiO_2$ | 40.18 |
| $Al_2O_3$ | 28.36 |
| CaO | 0.30 |
| $Na_2O$ | 15.12 |
| $K_2O$ | 2.50 |
| $H_2O^+$ | 13.59 |
| Total | 100.05 |

(1) Khibiny massif, Russia; corresponds to $(Na_{1.99}K_{0.22}Ca_{0.02})_{\Sigma=2.23}Al_{2.27}Si_{2.73}O_{10}•3.08H_2O$.
(2) Mont Saint-Hilaire, Canada; partial analysis; composition and formula based on tetranatrolite, corresponding to $(Na_{1.75}Ca_{0.10}K_{0.09})_{\Sigma=1.94}Fe_{0.01}Al_{1.95}Si_{3.02}O_{10}•2.98H_2O$.

**Mineral Group:** Zeolite group.

**Occurrence:** In miarolitic cavities and pegmatitic dikes within nepheline syenite in an intrusive alkalic gabbro-syenite complex (Mont Saint-Hilaire, Canada); in pegmatites in nepheline syenites in differentiated alkalic massifs (Kola Peninsula, Russia). Dehydrates in air to tetranatrolite.

**Association:** Natrolite, tetranatrolite (Mont Saint-Hilaire, Canada).

**Distribution:** At Mont Saint-Hilaire and from near Saint-Amable, Québec, Canada. In the Lovozero and Khibiny (e.g. Mount Kukisvumchorr) massifs, Kola Peninsula, Russia. At the Schellkopf, near Brenk, Eifel district, Germany. From Island Magee, Co. Antrim, Ireland.

**Name:** From the Greek *para*, for near, and its relation to natrolite.

**Type Material:** Royal Ontario Museum, Toronto, M35546; Canadian Museum of Nature, Ottawa, Canada, 37132.

**References:** (1) Chao, G.Y. (1980) Paranatrolite, a new zeolite from Mont St-Hilaire, Québec. Can. Mineral., 18, 85-88. (2) (1981) Amer. Mineral., 66, 1276-1277 (abs. ref. 1). (3) Khomyakov, A.P., G.Y. Cherepivskaya, and M.G. Mikheeva (1986) First paranatrolite finds in the USSR. Doklady Acad. Nauk SSSR, 288, 214-217 (in Russian). (4) Seryotkin, Yu.V., V.V. Bakakin, and I.A. Belitsky (2004) The crystal structure of paranatrolite. Eur. J. Mineral., 16, 545-550.