Natrolite $Na_2Al_2Si_3O_{10}\cdot 2H_2O$

Crystal Data: Orthorhombic, pseudotetragonal. *Point Group:* $mm2$. Crystals short to long prismatic, to 1 m, commonly with {110} terminated by {111}, striated ‖ elongation. In stellate or interlacing groups; also radiating fibrous, granular, or compact, massive. *Twinning:* On {110}, {011}, {031}.

Physical Properties: *Cleavage:* {110}, perfect; parting on {010}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5–5.5 D(meas.) = 2.20–2.26 D(calc.) = 2.25 Pyroelectric, piezoelectric; commonly fluoresces orange to yellow under UV.

Optical Properties: Transparent to translucent. *Color:* Colorless, white, gray, bluish, yellowish, pink; colorless in thin section. *Luster:* Vitreous to pearly.
Optical Class: Biaxial (+). *Orientation:* $X = a$; $Y = b$; $Z = c$. *Dispersion:* $r < v$, weak.
$\alpha = 1.473$–1.483 $\beta = 1.476$–1.486 $\gamma = 1.485$–1.496 2V(meas.) = 58°–64°

Cell Data: *Space Group:* $Fdd2$. $a = 18.272(6)$ $b = 18.613(6)$ $c = 6.593(2)$ Z = 8

X-ray Powder Pattern: Wingendorf, Lauban, Poland; may be confused with gonnardite. (ICDD 20-759).
2.85 (100), 5.89 (85), 2.87 (80), 4.35 (70), 6.55 (60), 3.16 (50), 3.19 (45)

Chemistry:

	(1)
SiO_2	47.60
Al_2O_3	27.40
CaO	0.13
Na_2O	15.36
K_2O	0.23
H_2O	9.47
Total	100.19

(1) Puy de Marman, France; corresponds to $(Na_{1.88}K_{0.02}Ca_{0.01})_{\Sigma=1.91}Al_{2.03}Si_{3.00}O_{10}\cdot 1.99H_2O$.

Polymorphism & Series: Dimorphous with tetranatrolite.

Mineral Group: Zeolite group.

Occurrence: In cavities in amygdaloidal basalts and related igneous rocks, one of the last minerals to form; fills seams in granite, gneiss, and syenite.

Association: Zeolites, calcite, nepheline, sodalite, quartz.

Distribution: Many localities, even for fine crystals. From the Höwenegg quarry, Hegau, Baden-Württemberg, Germany. At Puy de Marman, near Veyre, Puy-de-Dôme, France. In the Dean quarry, St. Keverne, Lizard Peninsula, Cornwall, England. At White Head, Co. Antrim, Ireland. From the Langesundsfjord and Tvedalen areas, Norway. In the Khibiny and Lovozero massifs, Kola Peninsula, Russia, large crystals. In the USA, at Bergen Hill, Hudson Co., at Prospect Park, Passaic Co., and in the Chimney Rock quarry, Bound Brook, Passaic Co., New Jersey; from north of Livingstone, Park Co., Montana; around Springfield, Lane Co., Oregon; and at the Gem mine, San Benito Co., California, USA. In Canada, huge crystals from the Johnston asbestos mine, near Thetford, and from Mont Saint-Hilaire, Quebec; in the Bay of Fundy district, Nova Scotia; and along the Ice River, British Columbia.

Name: From the Latin *natron*, for the sodium content.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 600–604. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 4, framework silicates, 358–376. (3) Artioli, G., J.V. Smith, and Å Kvick (1984) Neutron diffraction study of natrolite, $Na_2Al_2Si_3O_{10}\cdot 2H_2O$, at 20 K. Acta Cryst., C40, 1658–1662.