Edenite $\mathbf{NaCa_2(Mg, Fe^{2+})_5(Si_7Al)O_{22}(OH)_2}$

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Crystal Data: Monoclinic. *Point Group:* $2/m$. Commonly as well-formed prismatic crystals, to 2.5 cm; fibrous; as reaction rims on pyroxenes. *Twinning:* Simple or multiple twinning $\parallel$ {100}.

Physical Properties: *Cleavage:* Good on {110}, intersecting at 56° and 124°; partings on {100}, {001}. *Tenacity:* [Brittle.] Hardness = [5–6] D(meas.) = 3.05–3.37 D(calc.) = 3.06

Optical Properties: Semitransparent. *Color:* White, gray, pale green; color zoning is commonly seen in thin section. *Luster:* Vitreous.
Optical Class: Biaxial (–). *Pleochroism:* [Distinct, in greens, blue-greens, and yellow-browns.] *Orientation:* $Y = b$; $Z \wedge c = 18°$–$34°$. *Dispersion:* $r > v$, weak. *Absorption:* $Z > Y > X$.
$\alpha = 1.622$–1.665 $\beta = 1.632$–1.678 $\gamma = 1.641$–1.684 2V(meas.) = 50°–82°

Cell Data: *Space Group:* $C2/m$. $a = 9.837(4)$ $b = 17.954(6)$ $c = 5.307(2)$ $\beta = 105.18(2)°$ Z = 2

X-ray Powder Pattern: Franklin, New Jersey, USA. (ICDD 23-1405).
3.120 (100), 8.43 (80), 3.267 (40), 2.699 (20), 2.800 (18), 3.377 (12), 9.01 (10)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	50.91	50.55	Na_2O	3.40	2.35
TiO_2	0.08	0.51	K_2O	0.11	0.54
Al_2O_3	8.68	6.90	F		1.86
Fe_2O_3	1.61		H_2O^+	1.74	1.27
FeO	3.61	1.30	H_2O^-	0.17	
MnO	0.12	0.07	P_2O_5	0.05	
MgO	19.38	22.06	$-O = F_2$		0.78
CaO	10.25	13.30	Total	100.11	99.93

(1) Kotaki, Japan; corresponds to $(Na_{0.70}K_{0.02})_{\Sigma=0.72}(Ca_{1.54}Fe^{2+}_{0.22}Na_{0.22}Mn_{0.02})_{\Sigma=2.00}(Mg_{4.05}Al_{0.57}Fe^{2+}_{0.20}Fe^{3+}_{0.17}Ti_{0.01})_{\Sigma=5.00}(Si_{7.13}Al_{0.87})_{\Sigma=8.00}O_{22}(OH)_{1.63}$. (2) Franklin Marble, Orange Co., New York, USA; by electron microprobe, F by wet chemical analysis; corresponds to $(Na_{0.63}K_{0.10})_{\Sigma=0.73}(Ca_{1.99}Mn_{0.01})_{\Sigma=2.00}(Mg_{4.58}Al_{0.18}Fe^{2+}_{0.15}Ti_{0.05})_{\Sigma=4.96}(Si_{7.05}Al_{0.95})_{\Sigma=8.00}O_{22}[(OH)_{1.18}F_{0.82}]_{\Sigma=2.00}$.

Polymorphism & Series: Forms a series with ferro-edenite.

Mineral Group: Amphibole (calcic) group: $Mg/(Mg + Fe^{2+}) \geq 0.5$; $(Na + K)_A \geq 0.5$; $Na_B < 0.67$; $(Ca + Na)_B \geq 1.34$; 6.75 Si 7.25.

Occurrence: In intermediate plutonic igneous and medium-grade metamorphic rocks, as amphibolites and marbles.

Association: Titanite, mica, chondrodite (Edenville, New York, USA).

Distribution: In the USA, perhaps from Edenville, Orange Co., New York, and Franklin and Sterling Hill, Ogdensburg, Sussex Co., New Jersey. At Tory Hill, near Bancroft, and at Wilberforce, Ontario, Canada. From Kotaki, Niigata Prefecture, Japan.

Name: For the locality at Edenville, New York, USA, although it is not certain to occur there.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 386, 391. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 2, chain silicates, 263–314. (3) Kohn, J.A. and J.E. Comeforo (1955) Synthetic asbestos investigations, II: X-ray and other data on synthetic fluor-richterite, -edenite, and -boron edenite. Amer. Mineral., 40, 410–421. (4) Kearns, L.E., L.E. Kite, P.B. Leavens, and J.A. Nelen (1980) Fluorine distribution in the hydrous silicate minerals of the Franklin Marble, Orange County, New York. Amer. Mineral., 65, 557–562.

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