Ralstonite $Na_xMg_xAl_{2-x}(F,OH)_6 \cdot H_2O$

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Crystal Data: Cubic. *Point Group:* $4/m\ \overline{3}\ 2/m$. Crystals are dominantly octahedral or cubic, less commonly cubo-octahedral, to 1 cm.

Physical Properties: *Cleavage:* {111}, imperfect. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 4.5 D(meas.) = 2.56–2.62 D(calc.) = 2.56

Optical Properties: Transparent to translucent. *Color:* Colorless to white, milky; may be surficially discolored yellow by iron oxides; colorless in transmitted light. *Luster:* Vitreous. *Optical Class:* Isotropic; anomalously uniaxial or biaxial, sectored. n = 1.399–1.427

Cell Data: *Space Group:* $Fd3m$. a = 9.91(4) Z = 8

X-ray Powder Pattern: Ivigtut, Greenland.
5.74 (100), 1.765 (86), 2.88 (75), 3.01 (53), 1.508 (40), 1.923 (38), 2.29 (32)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
Na	4.27	9.86	5.4	Cl			0.05
K	0.12		0.02	O			[23.2]
Mg	4.39	10.28	5.6	H			[1.9]
Ca	0.03	0.95	0.02	OH	[19.46]	[4.22]	
Al	24.25	14.67	22.3	H_2O	8.43	8.65	
F	39.91	51.36	41.6	Total	[100.86]	[99.99]	[100.09]

(1) Ivigtut, Greenland; $(OH)^{1-}$ calculated for charge balance, corresponds to $Na_{0.35}Mg_{0.35}Al_{1.65}[F_{3.88}(OH)_{2.12}]_{\Sigma=6.00} \cdot 0.88H_2O$. (2) Do.; original total given as 96.29%, recalculated after deduction of mica 3.5%; original H_2O 10.30%, $(OH)^{1-}$ calculated for charge balance; then corresponds to $Na_{0.88}Mg_{0.88}Al_{1.12}[F_{5.5}(OH)_{0.5}]_{\Sigma=6.0} \cdot 0.99H_2O$. (3) Do.: by electron microprobe, H and O by difference.

Occurrence: In some granite pegmatites and greisenized zones rich in fluorine; in a hydrothermal antimony deposit in silicified limestones.

Association: Thomsenolite, cryolite, pachnolite, chiolite, elpasolite, colquiriite, gearksutite, weberite, prosopite, fluorite.

Distribution: From the Ivigtut cryolite deposit, southwestern Greenland. In the USA, at St. Peters Dome, near Pikes Peak, El Paso Co., and in the Goldie carbonatite, McClure Mountain-Iron Mountain, Fremont Co., Colorado; in the Morefield pegmatite mine, Amelia, Amelia Co., Virginia; from the Quitman Mountains, Hudspeth Co., Texas; in the Zapot pegmatite, 25 km northeast of Hawthorne, Fitting district, Mineral Co., Nevada. From near Colquiri, Oruro, Bolivia. In the Mt. Cleveland tin mine, western Tasmania, Australia. From near Lake Gjerdingen, Nordmarka, Norway. In the Cetine mine, 20 km southwest of Siena, Tuscany, Italy. At Perga, Volyn, Ukraine. From West Kayrakty, Kazakhstan. In the Zharchikhinsk molybdenum deposit, on the west side of Lake Baikal, eastern Siberia, and at the Tolbachik fissure volcano, Kamchatk Peninsula, Russia. Several other localities are reported but are minor or require authentication.

Name: Honoring Reverend J. Grier Ralston, of Norristown, Pennsylvania, USA, who first noted the species.

Type Material: Yale University, New Haven, Connecticut, USA, 1.4437.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 126–127. (2) Pauly, H. (1965) Ralstonite from Ivigtut, South Greenland. Amer. Mineral., 50, 1851–1864. (3) Effenberger, H. and F. Kluger (1984) Ralstonit: ein Beitrag zur Kenntnis von Zusammensetzung und Kristallstruktur. Neues Jahrb. Mineral., Monatsh., 97–108 (in German with English abs.).

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