Metasideronatrite $Na_2Fe^{3+}(SO_4)_2(OH)\cdot 1{-}2H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Rare crystals are prismatic, elongated along [001], showing {010}, {110}, {011}; typically in radiating aggregates, to 2.5 cm, and in flat mats and crusts.

Physical Properties: *Cleavage:* On {100}, {010}, perfect; on {001}, nearly perfect. *Fracture:* Fibrous. Hardness = 2.5 D(meas.) = 2.68 D(calc.) = 2.68 Reversibly alters from sideronatrite depending on relative humidity and exposure to sunlight; decomposes in boiling H_2O.

Optical Properties: Transparent. *Color:* Golden yellow, straw-yellow; yellow in transmitted light. *Luster:* Silky.
Optical Class: Biaxial (+). *Pleochroism:* X = colorless; Y = pale yellow; Z = brownish yellow. *Orientation:* $X = a$; $Y = b$; $Z = c$. *Dispersion:* $r > v$, strong. $\alpha = 1.543$ $\beta = 1.575$ $\gamma = 1.634$ 2V(meas.) = 60°

Cell Data: *Space Group:* *Pbnm* or $Pbn2_1$. $a = 7.357(3)$ $b = 16.002(4)$ $c = 7.102(8)$ Z = 2

X-ray Powder Pattern: Chuquicamata, Chile.
3.680 (100), 8.05 (90), 6.682 (70), 2.749 (50), 2.665 (50), 3.485 (40), 3.994 (30)

Chemistry:

	(1)	(2)	(3)
SO_3	48.66	48.68	46.15
Fe_2O_3	22.90	24.27	23.01
Na_2O	17.56	18.84	17.86
K_2O	0.26		
H_2O	9.75	8.21	12.98
insol.	0.60		
Total	99.73	100.00	100.00

(1) Chuquicamata, Chile; $(OH)^{1-}$ calculated for charge balance, corresponding to $(Na_{2.02}K_{0.02})_{\Sigma=2.04}Fe_{1.02}(SO_4)_{2.17}(OH)_{0.76}\cdot 1.55H_2O$. (2) $Na_2Fe(SO_4)_2(OH)\cdot H_2O$. (3) $Na_2Fe(SO_4)_2(OH)\cdot 2H_2O$.

Occurrence: An uncommon alteration product of pyrite, typically formed in arid climates but stably formed in sea-shore environments.

Association: Sideronatrite, metavoltine, ungemachite, ferrinatrite, alunogen, natrojarosite, pickeringite, sulfur, tamarugite, aluminocopiapite, metavoltine, mendozite, kornelite, gypsum.

Distribution: From Chuquicamata and the Sierra Gorda district, southwest of Calama, Antofagasta, Chile. In the USA, in the Capitol Reef National Monument, Wayne Co., Utah; from the Yazzie No. 101 mine, near Cameron, Coconino Co., Arizona; large radiating crystals at the Hot Springs Point sulfur mine, eight km east-southeast of Crescent Valley, Eureka Co., Nevada. In the Sydney coalfield, Nova Scotia, Canada. From Trerubies Cove, near Delabole, Cornwall, and at Barton-on-Sea, Hampshire, England. From north of Ballybunion, Co. Kerry, Ireland. At the Lanjarón mineral springs, Granada, Spain. In the Grotto de Faraglione, Port di Levante, Vulcano, Lipari Islands, Italy.

Name: From the Greek *meta*, signifying a lower hydrate, and its relation to *sideronatrite*.

Type Material: n.d.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 603–604. (2) Finney, J.J. (1973) Unit cell and X-ray powder data for metasideronatrite. Amer. Mineral., 58, 1080–1081. (3) Scordari, F. and G. Milella (1982) Metasideronatrite: a mixture of coexisting compounds. Neues Jahrb. Mineral., Monatsh., 255–264. (4) Scordari, F., F. Stasi, and G. Milella (1982) Concerning metasideronatrite. Neues Jahrb. Mineral., Monatsh., 341–347. (5) Bandy, M.C. (1938) Mineralogy of three sulphate deposits in northern Chile. Amer. Mineral., 23, 669–760, esp. 733–734.