

**Metasideronatrite****Na<sub>2</sub>Fe<sup>3+</sup>(SO<sub>4</sub>)<sub>2</sub>(OH)·1–2H<sub>2</sub>O**

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**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<sub>2</sub>O.

**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.  $\alpha = 1.543$   $\beta = 1.575$   $\gamma = 1.634$   $2V(\text{meas.}) = 60^\circ$

**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 <sub>3</sub>	48.66	48.68	46.15
Fe <sub>2</sub> O <sub>3</sub>	22.90	24.27	23.01
Na <sub>2</sub> O	17.56	18.84	17.86
K <sub>2</sub> O	0.26		
H <sub>2</sub> O	9.75	8.21	12.98
insol.	0.60		
Total	99.73	100.00	100.00

(1) Chuquicamata, Chile; (OH)<sup>1-</sup> calculated for charge balance, corresponding to (Na<sub>2.02</sub>K<sub>0.02</sub>)<sub>Σ=2.04</sub>Fe<sub>1.02</sub>(SO<sub>4</sub>)<sub>2.17</sub>(OH)<sub>0.76</sub>·1.55H<sub>2</sub>O. (2) Na<sub>2</sub>Fe(SO<sub>4</sub>)<sub>2</sub>(OH)·H<sub>2</sub>O. (3) Na<sub>2</sub>Fe(SO<sub>4</sub>)<sub>2</sub>(OH)·2H<sub>2</sub>O.

**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.

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