

# Natrojarosite



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**Crystal Data:** Hexagonal. *Point Group:*  $3m$ . Crystals, to 1 mm, are typically pseudocubic,  $\{01\bar{1}2\}$ , may be flattened on  $\{0001\}$  to give a hexagonal shape; typically in earthy crusts, pulverulent masses, and as a powder.

**Physical Properties:** *Cleavage:* Perfect on  $\{0001\}$ . *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 3 D(meas.) = 3.11–3.18 D(calc.) = 3.29

**Optical Properties:** Transparent to translucent. *Color:* Bright yellow, golden brown, cinnamon-brown. *Luster:* Vitreous.

*Optical Class:* Uniaxial (-); may exhibit sectorial anomalous birefringence. *Pleochroism:*  $O =$  pale yellowish;  $E =$  nearly colorless.  $\omega = 1.832(5)$   $\epsilon = 1.750(5)$

**Cell Data:** *Space Group:*  $R3m$ .  $a = 7.327\text{--}7.34$   $c = 16.634\text{--}16.72$   $Z = 3$

**X-ray Powder Pattern:** Gypsum Spring anticline, Carbon Co., Montana, USA. 5.06 (vs), 3.06 (s), 3.12 (ms), 2.24 (m), 1.98 (m), 5.57 (mw), 1.83 (mw)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
SO <sub>3</sub>	32.30	33.2	33.04	Na <sub>2</sub> O	6.32	7.0	6.39
P <sub>2</sub> O <sub>5</sub>	0.20			K <sub>2</sub> O	0.68	0.0	
Fe <sub>2</sub> O <sub>3</sub>	49.86	48.9	49.42	H <sub>2</sub> O	10.93	[10.9]	11.15
FeO	0.16						
				Total	100.45	[100.0]	100.00

(1) Kundip, Western Australia; corresponding to  $(\text{Na}_{0.94}\text{K}_{0.06})_{\Sigma=1.00}\text{Fe}_3(\text{SO}_4)_2(\text{OH})_6$ . (2) Tintic Standard mine, Dividend, Utah Co., Utah, USA; by electron microprobe, H<sub>2</sub>O by difference; corresponds to  $\text{Na}_{1.09}\text{Fe}_{2.95}(\text{SO}_4)_{2.00}(\text{OH})_{5.88}$ . (3)  $\text{NaFe}_3(\text{SO}_4)_2(\text{OH})_6$ .

**Polymorphism & Series:** Forms a series with jarosite.

**Mineral Group:** Alunite group.

**Occurrence:** Formed typically in the oxidized zone of mineral deposits by alteration of pyrite in the presence of sodium; rarely as a volcanic sublimate.

**Association:** Gypsum, alunite, jarosite, plumbojarosite.

**Distribution:** In small amounts at many localities. In the USA, on the east side of Soda Springs Valley, Mineral Co., and at Gilbert, 40 km east of Mina, Esmeralda Co., Nevada; at Cook's Peak, Luna Co., New Mexico; on the Georgia Sunset claim, about 6 km south of Kingman, Mohave Co., Arizona; in the Tintic district, Juab Co., Utah; from Palos Verdes, Los Angeles Co., California; at the Buxton mine, Lawrence Co., Kansas. Along Rapid Creek, Yukon Territory, Canada. In the San Toy mine, Santa Eulalia, Chihuahua, Mexico. From Chuquicamata, Antofagasta, Chile. In Spain, at the Rio Tinto mine, Huelva Province. From the Wanthwaite mine, St. John-in-the-Vale, Cumbria, England. On Valachov Hill, near Skřivava, and at Jáchymov (Joachimsthal), Czech Republic. From Modum, Norway. At Pavlodar, Kazakhstan. On volcanos along the Kamchatka Peninsula, Russia. In South Australia, at Boolcoomatta, and from Kundip, Philips River goldfield, Western Australia.

**Name:** As the sodium, *natrium*, analog of *jarosite*.

**Type Material:** Yale University, New Haven, Connecticut, USA, 3.3160; National Museum of Natural History, Washington, D.C., USA, 86932, R6307.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 563–565. (2) Brophy, G.P. and M.F. Sheridan (1965) Sulfate studies IV: the jarosite-natrojarosite-hydronium jarosite solid solution series. *Amer. Mineral.*, 50, 1595–1607. (3) Menchetti, S. and C. Sabelli (1976) Crystal chemistry of the alunite series: crystal structure refinement of alunite and synthetic jarosite. *Neues Jahrb. Mineral., Monatsh.*, 406–417. (4) Jambor, J.L. and J.E. Dutrizac (1983) Beaverite-plumbojarosite solid solutions. *Can. Mineral.*, 21, 101–113. (5) Mitchell, R.S. and W.F. Giannini (1958) Natrojarosite from near the Montana-Wyoming line. *Amer. Mineral.*, 43, 1205–1210.

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