

Tamarugite

NaAl(SO₄)₂·6H₂O

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Crystal Data: Monoclinic. *Point Group:* 2/m. As tabular {010} or short prismatic [001] crystals, with a multiplicity of additional forms, to 1 mm; may be fibrous or fine granular.

Twinning: Reportedly polysynthetic.

Physical Properties: *Cleavage:* {010}, perfect. Hardness = ~3 D(meas.) = 2.06(1) D(calc.) = 2.066 Soluble in H₂O, sweet astringent taste.

Optical Properties: Transparent. *Color:* Colorless; colorless in transmitted light.

Luster: Vitreous.

Optical Class: Biaxial (+). *Orientation:* Y = b; X ∧ c = 4°–5°. α = 1.484(1) β = 1.486(1) γ = 1.497(1) 2V(meas.) = ~60°

Cell Data: *Space Group:* P2₁/a. a = 7.353(2) b = 25.225(5) c = 6.097(2) β = 95.2(1)° Z = 4

X-ray Powder Pattern: Cerro Pintados, Chile.

4.223 (100), 4.207 (80), 3.647 (59), 3.964 (32), 2.899 (23), 3.153 (21), 12.54 (16)

Chemistry:

	(1)	(2)
SO ₃	45.66	45.72
Al ₂ O ₃	14.48	14.56
CaO	0.20	
Na ₂ O	9.04	8.85
Cl	0.12	
H ₂ O	30.86	30.87
–O = Cl ₂	[0.03]	
Total	[100.33]	100.00

(1) Cerro Pintados, Chile; original total 100.36% (2) NaAl(SO₄)₂·6H₂O.

Occurrence: A secondary mineral in oxidized sulfide-bearing alkali-rich aluminous rocks, with sodium supplied from hydrothermal solutions or sea-spray; as efflorescences in active geothermal systems; may be formed by reaction between acid sulfate solutions or fumarolic gas and wall rock.

Association: Pickeringite, coquimbite, quenstedtite, sideronatrite, mendozite, kröhnkite, halite, alunogen, meta-alunogen, potassium alum, epsomite, halotrichite, halite, gypsum, anhydrite.

Distribution: In Chile, from Cerro Pintados, 80 km southeast of Iquique, Tarapacá; in Antofagasta, at the Compania mine, eight km south of Sierra Gorda; from Alcaparrosa, near Cerritos Bayos, southwest of Calama; at Chuquicamata, and Quetena, west of Calama; in Atacama, at Tierra Amarilla, southeast of Copiapó. In Italy, in the Alum Cave, Vulcano, Lipari Islands; at the Furtei gold mine, Sardinia; from the Cetine mine, near Rosia, Tuscany, and at the Grotta dello Zolfo, Cape Miseno, Campania. In the Skouriotissa mine, Cyprus. At Compton Chine, Isle of Wight. From Saghand, Yazd, Iran. At the Myoban hot spring, Beppu, Oita Prefecture, Japan. From Anglesea, Victoria, Australia. In the Te Kopia geothermal area, New Zealand. On St. Bartholomew Island, West Indies. In the USA, near Eureka, St. Louis Co., and at Fulton, Calloway Co., Missouri. A number of other occurrences are known.

Name: For the originally-noted occurrence at Cerro Pintados, in the Tamarugal Pampa, Chile.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 466–468. (2) Robinson, P.D., J.H. Fang, and F.D. Bloss (1966) Cell dimensions and space group of tamarugite. *Amer. Mineral.*, 51, 1805–1807. (3) Robinson, P.D. and J.H. Fang (1969) Crystal structure and mineral chemistry of double-salt hydrates: I. Direct determination of the crystal structure of tamarugite. *Amer. Mineral.*, 54, 19–30.

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