

Natrochalcite**NaCu₂(SO₄)₂(OH)·H₂O**

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Crystal Data: Monoclinic. *Point Group:* 2/m. Steep pyramidal crystals, with large {111}, truncated by {001}, {110}, many smaller forms, to 1 cm; commonly cross-vein fibrous.

Physical Properties: *Cleavage:* On {001}, perfect. Hardness = 4.5 D(meas.) = 3.49(2) D(calc.) = 3.54 Slightly soluble in H₂O.

Optical Properties: Transparent to translucent. *Color:* Bright emerald-green. *Streak:* Pale greenish. *Luster:* Vitreous.

Optical Class: Biaxial (+). *Orientation:* Y = b; X ∧ c = -12°. *Dispersion:* r < v, strong, slightly inclined. α = 1.649 β = 1.655 γ = 1.714 2V(meas.) = 36°48'

Cell Data: *Space Group:* C2/m (synthetic). a = 8.809(1) b = 6.187(1) c = 7.509(1) β = 118.74(1)° Z = 2

X-ray Powder Pattern: Chuquicamata, Chile. (ICDD 19-1189). 2.797 (10), 6.57 (8), 3.44 (8), 2.522 (8), 3.20 (7), 4.82 (6), 2.302 (6)

| Chemistry: | (1) | (2) |
|-------------------|--------|--------|
| SO ₃ | 42.42 | 43.01 |
| CuO | 42.01 | 42.74 |
| Na ₂ O | 7.98 | 6.99 |
| H ₂ O | 7.71 | 7.26 |
| Total | 100.12 | 100.00 |

(1) Chuquicamata, Chile. (2) NaCu₂(SO₄)₂(OH)·H₂O.

Mineral Group: Tsumcorite group.

Occurrence: A rare mineral typically formed in an arid climate in the oxidized zone of copper deposits.

Association: Kröhnkite, antlerite, brochantite, chalcantinite, blödite, atacamite, gypsum (Chuquicamata, Chile); kröhnkite, brochantite (Capo Calamita, Italy).

Distribution: In Chile, from Chuquicamata, at the Fortuna mine, east of Baquedano, and from the Santiagina mine, Sierra Gorda, southwest of Calama, Antofagasta. At Capo Calamita, Elba, Italy.

Name: From the Latin for sodium, *natrium*, and the Greek for copper, *chalkos*, in the composition.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 97537, 97538.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 602–603. (2) Rumanova, I.M. and G.F. Volodina (1958) The crystal structure of natrochalcite, NaCu₂OH(SO₄)₂·H₂O = Na(SO₄)₂(Cu₂OH·H₂O). Doklady Acad. Nauk SSSR, 123, 78–81 (in Russian). (3) Giester, G. (1989) The crystal structures of Ag⁺Cu₂(OH)(SO₄)₂·H₂O and Me⁺Cu₂(OH)(SeO₄)₂·H₂O [Me⁺=Ag, Tl, NH₄], four new representatives of the natrochalcite type, with a note on natural natrochalcite. Zeits. Krist., 187, 239–247. (4) Beran, A., G. Giester, and E. Libowitzky (1997) The hydrogen bond system in natrochalcite-type compounds – an FTIR spectroscopic study of the H₃O₂⁻ unit. Mineral. Petrol., 61, 223–235.