

Kinoite**Ca₂Cu₂Si₃O₈(OH)₄**

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Crystal Data: Monoclinic. *Point Group:* 2/m. As well-formed crystals, to 1.5 mm, tabular on [100], somewhat elongated along [001]; also in veinlets, massive.

Physical Properties: *Cleavage:* Excellent on {010}; distinct on {100} and {001}.
Hardness = 4–5 D(meas.) = 3.16(3) D(calc.) = [3.20]

Optical Properties: Transparent to translucent. *Color:* Deep azurite-blue.
Optical Class: Biaxial (-). *Pleochroism:* Strong; X = pale greenish blue; Y = blue; Z = deep blue. *Orientation:* X = b; Z \wedge c \simeq 0°. *Dispersion:* r < v, distinct. *Absorption:* Z > Y > X.
 $\alpha = 1.638\text{--}1.640$ $\beta = 1.663\text{--}1.665$ $\gamma = 1.676\text{--}1.680$ 2V(meas.) = 68° 2V(calc.) = 64°–80°

Cell Data: *Space Group:* P2₁/m. a = 6.991(2) b = 12.884(3) c = 5.655(2)
 $\beta = 96^\circ 11(2)'$ Z = 2

X-ray Powder Pattern: Santa Rita Mountains, Arizona, USA.
4.72 (100), 3.052 (81), 6.44 (74), 2.116 (41), 3.138 (30), 2.315 (30), 3.951 (26)

Chemistry:	(1)	(2)
SiO ₂	35.90	36.97
CuO	31.10	32.63
MgO	0.15	
CaO	23.55	23.01
H ₂ O	8.16	7.39
Total	98.86	100.00

(1) Santa Rita Mountains, Arizona, USA. (2) Ca₂Cu₂Si₃O₈(OH)₄.

Occurrence: In vugs and veinlets in skarn (Santa Rita Mountains, Arizona, USA); in amygdules in basaltic lava flows (Calumet, Michigan, USA).

Association: Apophyllite, copper (Santa Rita Mountains, Arizona, USA); quartz, calcite, copper, silver, epidote, pumpellyite, chlorite (Calumet, Michigan, USA).

Distribution: In the USA, in Arizona, between Helvetia and Rosemont, Santa Rita Mountains, Pima Co., and in the Christmas copper mine, Gila Co.; in the Bawana mine, about six km northwest of Milford, Beaver Co., Utah; and in Michigan, in the Laurium and La Salle mines, Calumet, Houghton Co. and at the Northwestern mine, Keweenaw Co.

Name: For Fr. Eusebio Francisco Kino (1645–1711), Jesuit pioneer of the Sonora-Arizona-California frontier.

Type Material: Harvard University, Cambridge, Massachusetts, 109439; National Museum of Natural History, Washington, D.C., USA, 122395.

References: (1) Anthony, J.W. and R.B. Laughon (1970) Kinoite, a new hydrous copper calcium silicate mineral from Arizona. *Amer. Mineral.*, 55, 709–715. (2) Laughon, R.B. (1971) The crystal structure of kinoite. *Amer. Mineral.*, 56, 193–200. (3) Bauer, W.H. (1971) The prediction of bond length variations in silicon-oxygen bonds. *Amer. Mineral.*, 56, 1573–1599. (4) Ruotsala, A.P. and M.L. Wilson (1977) Kinoite from Calumet, Michigan. *Amer. Mineral.*, 62, 1032–1033.