Geminite $Cu(AsO_3OH)\cdot H_2O$

Crystal Data: Triclinic. *Point Group:* $\overline{1}$. As euhedral crystals, tabular on {001}, slightly elongated along [100], with {001}, {100}, {010}, and {*hk*0} forms, to 0.3 mm, usually in aggregates. *Twinning:* On {001}, polysynthetic, universal.

Physical Properties: *Cleavage:* {001}, perfect. *Fracture:* Irregular. *Tenacity:* Brittle. Hardness = 3–3.5 D(meas.) = 3.70(2) D(calc.) = [3.63]

Optical Properties: Transparent. *Color:* Light green to sea-green. *Streak:* Very pale green. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Pleochroism:* Weak; $X = Y$ = colorless; Z = pale green to pale gray. *Orientation:* $X' \wedge c \simeq 90°$; $Y' \wedge a = 17°$–$18.5°$; $Z' \wedge b = 13°$. *Dispersion:* $r > v$, weak. $\alpha = 1.656(2)$ $\beta = 1.692(2)$ $\gamma = 1.770(5)$ 2V(meas.) = 75(5)° 2V(calc.) = 71°

Cell Data: *Space Group:* $C\overline{1}$. $a = 9.841(2)$ $b = 10.818(2)$ $c = 15.733(3)$ $\alpha = 95.71(2)°$ $\beta = 90.94(2)°$ $\gamma = 103.11(2)°$ Z = 16

X-ray Powder Pattern: Cap Garonne mine, France.
7.83 (100), 3.260 (70), 3.070 (70), 3.925 (60), 2.611 (50), 3.107 (40), 2.825 (40)

Chemistry:

	(1)	(2)
As_2O_5	52.4	51.89
CuO	36.5	35.91
H_2O	11.0	12.20
Total	99.9	100.00

(1) Cap Garonne mine, France; by AA, H_2O by TGA; corresponds to $Cu_{1.04}(As_{1.03}O_3OH)\cdot H_2O$.
(2) $Cu(AsO_3OH)\cdot H_2O$.

Polymorphism & Series: Dimorphous with pushcharovskite.

Occurrence: From an arsenic-bearing oxidized Pb–Cu deposit (Cap Garonne mine, France); on specimens from mine dumps at a gold-bearing arsenic sulfide deposit (Salsigne mine, France).

Association: Tennantite, covellite, chalcanthite, lavendulan, pushcharovskite, antlerite, brochantite, quartz (Cap Garonne mine, France); lindackerite, yvonite, arsenopyrite, bismuth, chalcopyrite, pushcharovskite (Salsigne mine, France).

Distribution: In France, from the Cap Garonne mine, near le Pradet, Var, and in the Salsigne mine, 15 km north of Carcassone, Aude. At Jáchymov (Joachimsthal), Czech Republic. From Hartenstein, Saxony, Germany.

Name: From the Latin *gemini*, for *twins*, as the mineral is extensively twinned.

Type Material: Natural History Museum, Geneva, Switzerland, 435/80.

References: (1) Sarp, H. and P. Perroud (1990) Geminite, $Cu_2As_2O_7\cdot 3H_2O$, un nouveau minéral de la mine de Cap Garonne, Var, France. Schweiz. Mineral. Petrog. Mitt., 70, 309–314 (in French with English abs.). (2) (1992) Amer. Mineral., 77, 671 (abs. ref. 1). (3) Cooper, M.A. and F.C. Hawthorne (1995) The crystal structure of geminite, $Cu^{2+}(AsO_3OH)(H_2O)$, a heteropolyhedral sheet structure. Can. Mineral., 33, 1111–1118. (4) Prencipe, M., D.Y. Pushcharovskiy, H. Sarp, and G. Ferraris (1996) Comparative crystal chemistry of geminite $Cu[AsO_3OH]H_2O$ and minerals related to it. Moscow Univ. Bull. Series 4, Geol. 4, 66–74 (in Russian). (5) (1998) Amer. Mineral., 83, 911 (abs. ref. 4).