

Gonnardite



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Crystal Data: Tetragonal. *Point Group:* $\bar{4}2m$. Fibrous crystals, at the centers of radiating spherulites, to 3 cm; massive.

Physical Properties: Hardness = 5 D(meas.) = 2.25–2.36 D(calc.) = 2.33

Optical Properties: Translucent. *Color:* White, yellowish to salmon-red. *Luster:* Silky. *Optical Class:* Biaxial (+) or (-); commonly zoned. *Orientation:* $X = c$. $\alpha = 1.497\text{--}1.508$
 $\beta = 1.498\text{--}1.510$ $\gamma = 1.499\text{--}1.513$ $2V(\text{meas.}) = 50^\circ$

Cell Data: *Space Group:* $I\bar{4}2d$. $a = 13.21(1)$ $c = 6.622(4)$ $Z = 2$

X-ray Powder Pattern: Chaux de Bergonne, France; may be confused with natrolite and tetranatrolite.

2.92 (100), 5.93 (80), 6.70 (60), 4.44 (60), 4.74 (50), 3.23 (50), 3.12 (40)

Chemistry:

	(1)	(2)	(3)
SiO ₂	43.45	43.20	44.58
Al ₂ O ₃	27.91	27.90	25.22
CaO	6.95	3.61	6.94
Na ₂ O	8.69	13.16	7.66
H ₂ O	[13.00]	11.74	15.60
Total	[100.00]	99.61	100.00

(1) Chaux de Bergonne, France; by electron microprobe, H₂O by difference; corresponding to Na_{2.22}Ca_{0.98}Al_{4.32}Si_{5.71}O₂₀•5.70H₂O. (2) Aci Trezza, Sicily, Italy; corresponds to Na_{3.5}Ca_{0.5}Al_{4.5}Si_{5.9}O_{20.8}•5.35H₂O. (3) Na₂CaAl₄Si₆O₂₀•7H₂O.

Mineral Group: Zeolite group.

Occurrence: In cavities in basalt, leucite tephrite, and altered skarn.

Association: Zeolites, calcite.

Distribution: Well characterized material from: in France, at Chaux de Bergonne, Gignat, Puy de Dôme. In Italy, from Capo di Bove, near Rome, Lazio; and at Aci Castello, Aci Trezza, Osilo, and other places on Sardinia. From Arendal, Tvedalen, at Brevik and elsewhere around the Langesundsfjord, Norway. At Klöch, Styria, Austria. From the Schellkopf, near Brenk, Eifel district, and in the Höwenegg quarry, Hegau, Baden-Württemberg, Germany. From Allt Ribhein, Fiskavaig Bay, Isle of Skye, Scotland. In the USA, at Crestmore, Riverside Co., California, and around Honolulu, Oahu, Hawaii. At Mazé, Niigata Prefecture, Japan. A number of other localities are known.

Name: For Ferdinand Gonnard, French mineralogist, Lyons, France, who first noted the mineral.

Type Material: The Natural History Museum, London, England, 1930,166.

References: (1) Dana, E.S. (1899) Dana's system of mineralogy, (6th edition), app. I, 30. (2) Hey, M.H. and F.A. Bannister (1932) Studies on the zeolites. Part II. Thomsonite (including faroelite) and gonnardite. *Mineral. Mag.*, 23, 51–125. (3) Meixner, H., M.H. Hey, and A.A. Moss. (1956) Some new occurrences of gonnardite. *Mineral. Mag.*, 31, 265–271. (4) Mazzi, F., A.O. Larsen, G. Gottardi, and E. Galli (1986) Gonnardite has the tetrahedral framework of natrolite: experimental proof with a sample from Norway. *Neues Jahrb. Mineral., Monatsh.*, 219–228. (5) Nawaz, R. (1988) Gonnardite and disordered natrolite-group minerals: their distinction and relations with mesolite, natrolite and thomsonite. *Mineral. Mag.*, 52, 207–219.

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