

Crystal Data: Tetragonal, pseudocubic. *Point Group:* 422. As pseudo-octahedral crystals, to 4 mm, with {110} and {331}, rarely pseudocubic. Commonly dendritic to skeletal; as spherulites to several cm; fibrous or microcrystalline ("opal"), massive. *Twinning:* On {111}, common, interpenetrant, polysynthetic, repeated.

Physical Properties: *Tenacity:* Brittle. Hardness = 6–7 D(meas.) = 2.32–2.36 D(calc.) = 2.33

Optical Properties: Transparent. *Color:* Colorless, white, milky white to yellowish; in transmitted light, colorless. *Luster:* Vitreous.

Optical Class: Uniaxial (–). $\omega = 1.487$ $\epsilon = 1.484$

Cell Data: *Space Group:* $P4_12_12$. $a = 4.9709(1)$ $c = 6.9278(2)$ $Z = 4$

X-ray Powder Pattern: Synthetic.

4.05 (100), 2.485 (20), 2.841 (13), 3.135 (11), 1.870 (7), 2.465 (5), 2.118 (5)

Chemistry:

	(1)
SiO ₂	[99.13]
TiO ₂	0.38
Al ₂ O ₃	0.18
FeO	0.09
MnO	< 0.02
MgO	< 0.03
CaO	< 0.02
Na ₂ O	0.05
K ₂ O	0.17
P ₂ O ₅	< 0.03
Total	[100.00]

(1) Mare Imbrium, Moon; by electron microprobe, SiO₂ by difference.

Polymorphism & Series: Quartz, tridymite, coesite, and stishovite are polymorphs; inverts from high- or β -cristobalite at 268 °C or below.

Occurrence: In vesicles and lithophysae; a late-crystallizing phase in basaltic to rhyolitic volcanic rocks; from acid-sulfate-type hydrothermal alteration of volcanic rocks; precipitated by hot springs. By contact metamorphism of sandstone; developed during diagenesis, recrystallized from siliceous sedimentary rocks.

Association: Tridymite, quartz, sanidine, anorthoclase, fayalite, magnetite, kaolinite, alunite, "opal."

Distribution: On Cerro San Cristóbal, near Pachuca, Hidalgo, and in the Santín mine, Santa Caterina, Guanajuato, Mexico. In the USA, at Glass Mountain, Little Lake, and Sugarloaf Mountain, near Coso Hot Springs, Inyo Co., California; near Crater Lake, Klamath Co., Oregon; widespread in the San Juan Mountains, San Juan Co., Colorado. At Mayen and Mendig, Eifel district, Germany. From Sárospatak, Hungary. In the Ellora Caves, Maharashtra, India. From the Tokatoka district, about 150 km north of Auckland, New Zealand. In Japan, at Goroyama, Nagano Prefecture; Futo, Shizuoka Prefecture; and many other places.

Name: For the first-noted occurrence at Cerro San Cristóbal, Mexico.

References: (1) Frondel, C. (1962) Dana's system of mineralogy, (7th edition), v. III, silica minerals, 273–286. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 4, framework silicates, 179–230. (3) Mason, B.F. (1972) Lunar tridymite and cristobalite. Amer. Mineral., 57, 1530–1535. (4) Pluth, J.J., J.V. Smith, and J. Faber, Jr. (1985) Crystal structure of low cristobalite at 10, 293, and 473 K: variation of framework geometry with temperature. J. Appl. Physics, 57, 1045–1049. (5) (1960) NBS Circ. 539, 10, 48.

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