

Orthojoaquinite-(Ce)

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$ or $mm2$. Intergrown with joaquinite-(Ce). *Twinning:* Submicroscopic, polysynthetic twinning $\parallel \{001\}$.

Physical Properties: Cleavage: Good on $\{001\}$. Hardness = 5-5.5 VHN = 350-430 (by analogy to orthojoaquinite-(La)). $D(\text{meas.}) = 3.98(5)$ $D(\text{calc.}) = 3.95$

Optical Properties: Transparent. *Color:* [Brown.] *Luster:* n.d.
Optical Class: Biaxial (+). $\alpha = 1.753(1)$ $\beta = 1.767(1)$ $\gamma = 1.822(2)$ $2V(\text{meas.}) = \sim 30\text{-}55^\circ$
Pleochroism: $X = Y =$ colorless, $Z =$ pale yellow.

Cell Data: *Space Group:* $Ccmm$, $Ccm2$, or $Cc2m$. $a = 10.48$ $b = 9.66$ $c = 22.26$ $Z = [4]$

X-ray Powder Pattern: New Idria, San Benito Co., California, USA.
 2.943 (100), 4.43 (95), 2.890 (85), 3.29 (60), 2.606 (60), 1.388 (55), 1.866 (50)

Chemistry:	(1)		(1)
SiO ₂	34.97	CaO	0.21
TiO ₂	11.83	SrO	3.20
ThO ₂	0.27	BaO	22.44
Y ₂ O ₃	0.70	Na ₂ O	1.87
RE ₂ O ₃	18.46	K ₂ O	0.03
FeO	4.09	<u>H₂O</u>	<u>[1.88]</u>
MnO	0.00	Total	[100.00]
MgO	0.05		

(1) San Benito Co., California, USA; average of 6 electron microprobe analyses supplemented by IR spectroscopy, H₂O by difference, RE₂O₃ = Ce₂O₃ 10.69%, Nd₂O₃ 3.21%, La₂O₃ 2.14%, Pr₂O₃ 1.25%, Sm₂O₃ 0.70%, Gd₂O₃ 0.26%, Dy₂O₃ 0.21%, Er₂O₃ 0.00%, H₂O by difference; corresponds to Na_{0.83}K_{0.01}Ba_{2.01}Ca_{0.05}Mg_{0.02}(Ce_{0.90}RE_{0.72}Sr_{0.42}) $\Sigma=2.04$ Fe_{0.78}Ti_{2.04}Th_{0.02}Si_{8.00}O_{24.68}(OH)_{3.32}.

Polymorphism & Series: Dimorphous with joaquinite-(Ce).

Mineral Group: Joaquinite group.

Occurrence: In a natrolite vein cutting a glaucophane schist inclusion in a serpentinite body (San Benito Co., California, USA).

Association: Joaquinite-(Ce), benitoite, neptunite, natrolite (San Benito Co., California, USA).

Distribution: At the Gem mine, San Benito Co., California, USA.

Name: For its ORTHOrhombic symmetry and relation to joaquinite-(Ce).

Type Material: n.d.

References: (1) Laird, J. and A.L. Albee (1972) Chemical composition and physical, optical, and structural properties of benitoite, neptunite, and joaquinite. *Amer. Mineral.*, 57, 85-102. (2) Wise, W.S. (1982) Strontiojoaquinite and barrio-orthojoaquinite: two new members of the joaquinite group. *Amer. Mineral.*, 67, 809-816. (3) Matsubara, S., J.A. Mandarino, and E.I. Semenov (2001) Redefinition of a mineral in the joaquinite group: orthojoaquinite-(La). *Can. Mineral.*, 39, 757-760. (4) (2002) *Amer. Mineral.*, 87, 355 (abs. ref. 3).