Joaquinite-(Ce) $\mathbf{NaBa_2Ce_2Fe^{2+}Ti_2Si_8O_{26}(OH)\cdot H_2O}$

Crystal Data: Monoclinic, pseudo-orthorhombic. *Point Group:* 2. As equant or tabular crystals, flattened ⊥ [001], up to 1.2 cm; intimately intergrown with orthojoaquinite-(Ce). *Twinning:* On {001}, polysynthetic, common.

Physical Properties: *Cleavage:* {001}, good. Hardness = 5.5 D(meas.) = 3.89–3.98 D(calc.) = [3.93]

Optical Properties: Transparent to translucent. *Color:* Honey-yellow to brown. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Pleochroism:* Weak; $X = Y$ = colorless; Z = pale yellow. *Orientation:* $X = a$; $Y = b$; $Z = c$. *Dispersion:* $r < v$, perceptible. *Absorption:* $Z > Y > X$. $\alpha = 1.748$–1.753 $\beta = 1.767$ $\gamma = 1.822$–1.823 2V(meas.) = 30°–55°

Cell Data: *Space Group:* $C2$. $a = 10.516(3)$ $b = 9.686(3)$ $c = 11.833(4)$ $\beta = 109.67(3)°$ Z = 2

X-ray Powder Pattern: San Benito Co., California, USA.
2.943 (100), 4.43 (95), 2.890 (85), 3.29 (60), 2.606 (60), 3.05 (40), 2.978 (40)

Chemistry:

	(1)		(1)
SiO_2	34.97	MgO	0.05
TiO_2	11.83	CaO	0.21
ThO_2	0.27	SrO	3.20
Y_2O_3	0.70	BaO	22.44
RE_2O_3	18.46	Na_2O	1.87
FeO	4.09	K_2O	0.03
MnO	0.00	H_2O	[1.88]
		Total	[100.00]

(1) San Benito Co., California, USA; by electron microprobe, average of six points on five grains, intergrown with orthojoaquinite-(Ce) of presumably nearly identical composition; RE_2O_3 = La_2O_3 2.14%, Ce_2O_3 10.69%, Pr_2O_3 1.25%, Nd_2O_3 3.21%, Sm_2O_3 0.70%, Gd_2O_3 0.26%, Dy_2O_3 0.21%, Er_2O_3 0.00%, H_2O 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 orthojoaquinite-(Ce).

Mineral Group: Joaquinite group.

Occurrence: In a natrolite vein cutting a glaucophane schist inclusion in a serpentinite body (San Benito Co., California, USA); in fenitized gneisses and alkalic syenites (Seal Lake, Canada).

Association: Orthojoaquinite-(Ce), benitoite, neptunite, natrolite (San Benito Co., California, USA); aegirine, barylite, eudidymite, neptunite (Seal Lake, Canada).

Distribution: At the Gem mine and to its north, on Santa Rita peak; at Mina Numero Uno and on the Victor claim, San Benito Co., California; from Granite Mountain, near Little Rock, Pulaski Co., Arkansas, USA. In Canada, at Seal Lake, Labrador, Newfoundland, and Mont Saint-Hilaire, Quebec. Along the Narssaq river, near Kvanefjeld, in the Ilímaussaq intrusion, southern Greenland.

Name: For Joaquin Ridge, near the original locality at the Gem mine, California, USA.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 90840.

References: (1) Louderback, G.D. (1909) Benitoite, its paragenesis and mode of occurrence. Univ. of Calif., Bull. Dept. of Geol., 5, 331–380. (2) Palache, C. and W.F. Foshag (1932) The chemical nature of joaquinite. Amer. Mineral., 17, 308–312. (3) 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. (4) Dowty, E. (1975) Crystal structure of joaquinite. Amer. Mineral., 60, 872–878. (5) Wise, W.S. (1982) Strontiojoaquinite and bario-orthojoaquinite: two new members of the joaquinite group. Amer. Mineral., 67, 809–816.