

**Perrierite****(Ce, La, Ca)<sub>4</sub>(Fe<sup>2+</sup>, Mg)<sub>2</sub>(Ti, Fe<sup>3+</sup>)<sub>3</sub>Si<sub>4</sub>O<sub>22</sub>**

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**Crystal Data:** Monoclinic; commonly metamict. *Point Group:* 2/*m*. As elongated prismatic crystals, to 7 mm, resembling epidote, with 15 forms recognized; granular, massive. *Twinning:* Common on {100}.

**Physical Properties:** *Fracture:* Uneven to conchoidal. Hardness = 5.5 D(meas.) = 4.29–4.45 D(calc.) = 4.77

**Optical Properties:** Nearly opaque to translucent. *Color:* Black, brownish, dark reddish brown. *Streak:* Brown. *Luster:* Resinous, lustrous to dull. *Optical Class:* Biaxial (–). *Pleochroism:* Marked; X = yellow; Y = opaque to dark red-violet; Z = opaque to dark brown. *Orientation:* Z = *b*; X ∧ *a* = 24°. *Dispersion:* *r* > *v*, strong. *Absorption:* Strong; Z ≥ Y ≫ X. α = 1.90–1.95 β = [2.01] γ = 2.02–2.06 2V(meas.) = ~60°

**Cell Data:** *Space Group:* P2<sub>1</sub>/*a*. *a* = 13.59–13.61 *b* = 5.61–5.62 *c* = 11.63–11.73 β = 113.28°–113.95° Z = 2

**X-ray Powder Pattern:** Nettuno, Italy; close to chevkinite. 2.92 (100), 1.94 (78), 2.15 (55), 1.65 (55), 1.34 (55), 1.24 (47), 2.81 (46)

<b>Chemistry:</b>	(1)	(2)		(1)	(2)		(1)	(2)
SiO <sub>2</sub>	19.31	20.64	La <sub>2</sub> O <sub>3</sub>	6.83	21.01	CaO	4.11	3.94
TiO <sub>2</sub>	23.24	19.15	RE <sub>2</sub> O <sub>3</sub>		4.65	SrO		1.28
ThO <sub>2</sub>	4.05	0.68	Fe <sub>2</sub> O <sub>3</sub>	1.26		Na <sub>2</sub> O	1.05	0.47
Al <sub>2</sub> O <sub>3</sub>	0.67	0.38	FeO	4.05	8.17	K <sub>2</sub> O	trace	trace
Y <sub>2</sub> O <sub>3</sub>	1.51	0.40	MnO		1.70	H <sub>2</sub> O	0.61	
Ce <sub>2</sub> O <sub>3</sub>	31.80	18.24	MgO	0.81	0.40	Total	99.30	[101.10]

(1) Nettuno, Italy. (2) Bjørkedalen, Norway; by electron microprobe, original total given as 101.11%; RE<sub>2</sub>O<sub>3</sub> = Pr<sub>2</sub>O<sub>3</sub> 2.16%, Nd<sub>2</sub>O<sub>3</sub> 2.25%, Tb<sub>2</sub>O<sub>3</sub> 0.13%, Yb<sub>2</sub>O<sub>3</sub> 0.11%; corresponds to (La<sub>1.51</sub>Ce<sub>1.30</sub>Ca<sub>0.47</sub>RE<sub>0.37</sub>Na<sub>0.18</sub>Sr<sub>0.14</sub>Th<sub>0.03</sub>)<sub>Σ=4.00</sub>(Ti<sub>2.81</sub>Fe<sup>2+</sup><sub>1.33</sub>Ca<sub>0.36</sub>Mn<sub>0.28</sub>Mg<sub>0.12</sub>Al<sub>0.09</sub>)<sub>Σ=4.99</sub>Si<sub>4.02</sub>O<sub>22</sub>.

**Polymorphism & Series:** Dimorphous with chevkinite.

**Occurrence:** In sands derived from weathered tuffs (Nettuno, Italy); in pockets in “hypersthene” granodiorite (Burley Farm, Virginia, USA); in syenite pegmatites (Oslo, Norway).

**Association:** Microcline, aegirine, loparite, pyrophanite (Oslo, Norway).

**Distribution:** In Italy, at Nettuno, Lazio, and on Mt. Amiata, Tuscany. In the USA, in Virginia, on the Burley Farm and at Wares Gap, Amherst Co., north of Chamblissburg, Bedford Co., and on Hat Creek and east of Roseland, Nelson Co.; in Nebraska, at Chimney Rock, Morrill Co.; from near Yucca Mountain, Nye Co., Nevada. At the Desmont mine, near Wilberforce, and west of Golden Lake, Ontario, Canada. From near Bangalore, Karnataka, and at Kanjamalaiu, near Salem, Tamil Nadu, India. At Omiya, Kyoto Prefecture, Japan. In the Orlovsk massif, Altai Mountains, and the Burpala massif, about 120 km north of Lake Baikal, eastern Siberia, Russia. From Mantyhärju, Finland. At Sogndal, Bjørkedalen, and Sandefjord, near Oslo, Norway. From Bingre, Mozambique.

**Name:** For Carlo Perrier (1886–1948), Italian mineralogist.

**Type Material:** n.d.

**References:** (1) Bonatti, S. and G. Gottardi (1950) Perrierite, nuovo minerale ritrovato nella sabbia di Nettuno (Roma). Atti Rend. Accad. Lincei, Ser. 8, 9, 361–368 (in Italian). (2) (1951) Amer. Mineral., 36, 926 (abs. ref. 1). (3) Bonatti, S. and G. Gottardi (1953) Nuovi dati sulla perrierite. Rend. Soc. Ital. Mineral. Petrol., 9, 208–225 (in Italian with English abs.). (4) Calvo, C. and R. Faggiani (1974) A re-investigation of the crystal structures of chevkinite and perrierite. Amer. Mineral., 59, 1277–1285. (5) Segalstad, T.V. and A.O. Larsen (1978) Chevkinite and perrierite from the Oslo Region, Norway. Amer. Mineral., 63, 499–505.

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