

**Monazite-(La)****(La, Ce, Nd)PO<sub>4</sub>**

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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . [Crystals typically tabular on {100}, may be prismatic, equant or wedge-shaped; granular, massive] [by analogy to monazite-(Ce)].

**Physical Properties:** *Cleavage:* [{100}, distinct; {010}, poor.] *Fracture:* [Conchoidal to uneven.] *Tenacity:* [Brittle.] *Hardness* = [5–5.5] *D*(meas.) = 5.17–5.27 *D*(calc.) = 5.13  
Radioactive if thorium-rich.

**Optical Properties:** [Translucent.] *Color:* [Yellowish to dark brown, pale red, yellow.]  
*Luster:* [Resinous, waxy, vitreous to adamantine.]  
*Optical Class:* Biaxial (+).  $\alpha = 1.785\text{--}1.791$   $\beta = 1.787\text{--}1.791$   $\gamma = 1.840\text{--}1.844$   
 $2V$ (meas.) =  $10^\circ\text{--}14^\circ$

**Cell Data:** *Space Group:*  $P2_1/n$  (ICDD 35-731).  $a = 6.84$   $b = 7.07$   $c = 6.45$   
 $\beta = 103.85^\circ$   $Z = 4$

**X-ray Powder Pattern:** Synthetic LaPO<sub>4</sub>.  
3.12 (100), 3.31 (85), 2.15 (40), 2.88 (35), 3.53 (20), 3.01 (20), 2.21 (20)

**Chemistry:**

	(1)
P <sub>2</sub> O <sub>5</sub>	26.81
U <sub>3</sub> O <sub>8</sub>	0.21
SiO <sub>2</sub>	2.24
ThO <sub>2</sub>	4.51
Al <sub>2</sub> O <sub>3</sub>	0.36
Fe <sub>2</sub> O <sub>3</sub>	0.48
Ce <sub>2</sub> O <sub>3</sub>	24.58
La <sub>2</sub> O <sub>3</sub>	38.51
PbO	0.03
CaO	0.86
H <sub>2</sub> O	0.91
Total	99.50

(1) Ebisie mine, Japan. (2) Near Kokšín, Czech Republic; by electron microprobe, analysis not given; corresponds to (La<sub>0.35</sub>Ce<sub>0.30</sub>Nd<sub>0.21</sub>Pr<sub>0.05</sub>Gd<sub>0.03</sub>Ca<sub>0.02</sub>Sm<sub>0.02</sub>Tb<sub>0.01</sub>Tm<sub>0.01</sub>)<sub>Σ=1.00</sub>PO<sub>4</sub>.

**Mineral Group:** Monazite group.

**Occurrence:** In fissure veins, granite and gneissic metamorphic rocks.

**Association:** n.d.

**Distribution:** From the Kounrad Massif, northern Balkhash region, Kazakhstan. At Kokšín, near Mítov, Czech Republic. From Poiana Marului, Muntele Mic Mountains, Romania. In the Gasteiner Tal, Austria. At the Ebisie mine, Wada, Gifu Prefecture, Japan. From Ratnapura, Sri Lanka. Along the Grey River, Westland, New Zealand. In Dickens Township, Nipissing district, Ontario, Canada. From Shinkolobwe, Katanga Province, Congo (Shaba Province, Zaire).

**Name:** For the member of the *monazite* group with dominant *lanthanum*.

**Type Material:** n.d.

**References:** (1) Borovskii, I.B. and V.I. Gerasimovskii (1945) Rare earths in minerals. Doklady Acad. Nauk SSSR, 49, 353–356 (in Russian). (2) Chang, L.L.Y., R.A. Howie, and J. Zussman (1996) Rock-forming minerals, (2nd edition), v. 5B, non-silicates, 335–352. (3) Johan, Z., V. Johan, B. Scharm and Z. Pouba (1995) Minéralogie et géochimie des terres rares et du chrome dans les cherts protérozoïques de Kokšín, République tchèque. Compt. Rendus Acad. Sci. Paris, 321, 1127–1138 (in French with English abs.). (4) Carron, M.K., F.A. Hildebrand, C.R. Naeser, and H.J. Rose, Jr. (1958) Fractional precipitation of rare earths with phosphoric acid. U.S. Geol. Survey Bull. 1036N, 253–275.

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