Lithiophosphate Li_3PO_4

Crystal Data: Orthorhombic. *Point Group:* $mm2$. Crystals are elongated along [010], showing prominent {110}, {101}, with {010}, {013}, {001}, to 5 cm; typically as cleavages.

Physical Properties: *Cleavage:* Perfect on {010}; distinct on {110}, may be a parting. Hardness = 4 D(meas.) = 2.46–2.478 D(calc.) = 2.479 (synthetic). Turquoise-blue cathodoluminescence. Slightly soluble in hot H_2O.

Optical Properties: Transparent in thin flakes. *Color:* Colorless, white, may be pale rose or buff. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Orientation:* $X = c$; $Y = a$; $Z = b$. α = 1.550–1.553 β = 1.557–1.558 γ = 1.566–1.567 2V(meas.) = 69°– ∼80°

Cell Data: *Space Group:* $Pmn2_1$ (synthetic). $a = 6.1155$ $b = 5.2340$ $c = 4.8452$ Z = 2

X-ray Powder Pattern: Mt. Okhmyl'k, Russia.
3.965 (10), 2.635 (10), 3.794 (9), 2.420 (9), 2.311 (9), 1.513 (9), 3.552 (8)

Chemistry:

	(1)	(2)
P_2O_5	59.92	61.29
SiO_2	1.14	
Al_2O_3	0.62	
Fe_2O_3	0.04	
MnO	0.01	
MgO	0.15	
CaO	0.88	
Na_2O	0.05	
Li_2O	37.07	38.71
F	trace	
H_2O^+	0.33	
H_2O^-	0.06	
Total	100.27	100.00

(1) Mt. Okhmyl'k, Russia; after deduction of 1.04% quartz, 1.38% montebrasite, 1.33% apatite, corresponds to $Li_{3.00}(PO_4)_{1.00}$. (2) Li_3PO_4.

Occurrence: Formed by hydrothermal replacement of montebrasite in the core of a granite pegmatite in amphibolite (Mt. Okhmyl'k, Russia); in a lithium-rich granite pegmatite (Foote mine, North Carolina, USA).

Association: Montebrasite, apatite, quartz, spodumene, lepidolite, beryl, elbaite, pollucite, tantalite, cassiterite, microcline (Mt. Okhmyl'k, Russia); leucophosphite, huréaulite, switzerite, jahnsite, rockbridgeite (Tip Top mine, South Dakota, USA).

Distribution: On Mt. Okhmyl'k, Voron'i massif, Kola Peninsula, Russia. In the USA, from the Foote mine, near Kings Mountain, Cleveland Co., North Carolina; at the Tip Top mine, 8.5 km southwest of Custer, Custer Co., South Dakota. Large crystals in the Tanco pegmatite, Bernic Lake, Manitoba, Canada.

Name: For its content of *lithium* and *phosphate*.

Type Material: Geology Museum, Kola Branch, Academy of Sciences, Apatity, 3347; Vernadsky Geological Museum, Moscow, 48601; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 58501.

References: (1) Matias, V.V. and A.M. Bondareva (1957) Lithiophosphate – a new mineral. Doklady Acad. Nauk SSSR, 112, 124–126 (in Russian). (2) (1957) Amer. Mineral., 42, 585 (abs. ref. 1). (3) White, J.S., Jr. (1969) A lithiophosphate occurrence in North Carolina. Amer. Mineral., 54, 1467–1469. (4) Bondareva, O.S., M.A. Simonov, and N.V. Belov (1978) Crystal structure of the synthetic analog of lithiophosphate, γ−$LiPO_4$. Kristallografiya (Sov. Phys. Crystal.), 23, 287–288. (5) (1966) NBS Mono. 25(4), 21.