Kipushite $(Cu, Zn)_6(PO_4)_2(OH)_6 \cdot H_2O$

Crystal Data: Monoclinic. *Point Group:* $2/m$. As prismatic crystals, elongated along $[10\overline{1}]$, exhibiting {111} with uneven, rounded faces and terminated by {100}, to 5 mm; additional forms include {102}, $\{01\overline{2}\}$, $\{11\overline{1}\}$. More commonly as aggregates of subparallel prismatic crystals.

Physical Properties: *Fracture:* Uneven. Hardness = 4 D(meas.) = 3.8 D(calc.) = 3.904

Optical Properties: Transparent to translucent. *Color:* Emerald-green. *Streak:* Pale blue. *Luster:* Vitreous.
Optical Class: Biaxial (–). *Pleochroism:* X = colorless; Y = blue; Z = bright blue.
$\alpha = 1.693(2)$ $\beta = 1.738(2)$ $\gamma = 1.740(2)$ 2V(meas.) = Small. 2V(calc.) = 23°

Cell Data: *Space Group:* $P2_1/c$. $a = 12.197(2)$ $b = 9.156(2)$ $c = 10.667(2)$
$\beta = 96.77(2)°$ Z = 4

X-ray Powder Pattern: Kipushi, Congo.
4.03 (100), 2.554 (90), 2.970 (60), 1.531 (60b), 12.2 (50), 3.386 (45), 6.06 (40)

Chemistry:

	(1)
P_2O_5	20.9
CuO	43.0
ZnO	24.4
H_2O	11.1
Total	99.4

(1) Kipushi, Congo; by electron microprobe, average of 14 analyses on two crystals, H_2O by TGA; $(OH)^{1-}$ calculated for charge balance, corresponding to $(Cu_{3.77}Zn_{2.09})_{\Sigma=5.86}(PO_4)_{2.06}(OH)_{5.54} \cdot 1.5H_2O$.

Occurrence: A secondary mineral in the oxidized zone of a Cu–Zn deposit (Kipushi, Congo).

Association: Pseudomalachite, malachite, hemimorphite, pyromorphite, veszelyite, vauquelinite, libethenite, reichenbachite, quartz, iron oxides (Kipushi, Congo).

Distribution: From Kipushi, 28 km southwest of Lubumbashi, Katanga Province, Congo (Shaba Province, Zaire). In the USA, in the Black Pine mine, near Philipsburg, Granite Co., Montana, and at the Snowstorm mine, near Battle Mountain, Lander Co., Nevada. From Broken Hill, New South Wales, Australia.

Name: For Kipushi, Congo, where the first specimens were collected.

Type Material: Royal Museum of Central Africa, Tervuren, Belgium, RMG14026.

References: (1) Piret, P., M. Deliens, and J. Piret-Meunier (1985) Occurrence and crystal structure of kipushite, a new copper-zinc phosphate from Kipushi, Zaire. Can. Mineral., 23, 35–42. (2) (1986) Amer. Mineral., 71, 228–229 (abs. ref. 1). (3) Braithwaite, R.S.W. and G. Ryback (1988) Philipsburgite from the Caldbeck Fells and kipushite from Montana, and their infrared spectra. Mineral. Mag., 52, 529–533.