Kipushite  \((\text{Cu, Zn})_6(\text{PO}_4)_2(\text{OH})_6\cdot\text{H}_2\text{O}\)

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**Crystal Data:** Monoclinic. \textit{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:** \textit{Fracture:} Uneven. \textit{Hardness} = 4  \(\text{D(meas.)} = 3.8\)  \(\text{D(calc.)} = 3.904\)


\textit{Optical Class:} Biaxial (\(\cdot\)). \textit{Pleochroism:} \(X = \) colorless; \(Y = \) blue; \(Z = \) bright blue.

\[\begin{align*}
\alpha & = 1.693(2) \\
\beta & = 1.738(2) \\
\gamma & = 1.740(2) \\
2V(\text{meas.}) & = \text{Small}. \\
2V(\text{calc.}) & = 23^\circ
\end{align*}\]

**Cell Data:** \textit{Space Group:} \(P2_1/\text{c}\). \(a = 12.197(2)\)  \(b = 9.156(2)\)  \(c = 10.667(2)\)

\[\beta = 96.77(2)^\circ \quad Z = 4\]

**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:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Formula</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{P}_2\text{O}_5)</td>
<td>20.9</td>
<td></td>
</tr>
<tr>
<td>(\text{CuO})</td>
<td>43.0</td>
<td></td>
</tr>
<tr>
<td>(\text{ZnO})</td>
<td>24.4</td>
<td></td>
</tr>
<tr>
<td>(\text{H}_2\text{O})</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>99.4</strong></td>
<td></td>
</tr>
</tbody>
</table>

(1) Kipushi, Congo; by electron microprobe, average of 14 analyses on two crystals, \(\text{H}_2\text{O}\) by TGA; \((\text{OH})^{1-}\) calculated for charge balance, corresponding to \((\text{Cu}_{3.77}\text{Zn}_{2.09})\Sigma=5.86\)

\((\text{PO}_4)_{2.06}(\text{OH})_{0.54}\cdot1.5\text{H}_2\text{O}\).

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

**Association:** Pseudomalachite, malachite, hemimorphite, pyromorphite, veszelyite, vanquelinite, 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:**