Herbertsmithite

Crystal Data: Hexagonal.  Point Group: 3 2/m.  As rhombohedra to 1 mm.

Hardness = 3-3.5  D(meas.) = 3.75-3.95  D(calc.) = 3.75

Luster: Vitreous.
Optical Class: Uniaxial (-).  ε = 1.817(2)  ω = 1.825(2)
Pleochroism: Green to greenish blue, weak.  Absorption: O > E.

Cell Data:  Space Group: R 3 m.  a = 6.834(1)  c = 14.075(2)  Z = 3

X-ray Powder Pattern: Mina Los Tres Presidentes, Chile.
2.764 (100), 5.466 (55), 2.266 (36), 1.709 (18), 4.702 (14), 2.730 (13), 1.820 (13)

Chemistry:

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CuO</td>
<td>56.1</td>
</tr>
<tr>
<td>ZnO</td>
<td>18.2</td>
</tr>
<tr>
<td>Cl</td>
<td>17.2</td>
</tr>
<tr>
<td>H₂O</td>
<td>12.5</td>
</tr>
<tr>
<td>-O = Cl₂</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>100.1</td>
</tr>
</tbody>
</table>

(1) Mina Los Tres Presidentes, Chile; average of 5 electron microprobe analyses, H₂O by TGA; corresponding to Cu₃.₀₂Zn₀.₉₆(OH)₅.₉₉H₀.₀₉Cl₂₀₈.

Polymorphism & Series: Forms a solid-solution series with Zn-stabilized paratacamite.

Occurrence: A secondary mineral in the oxidation zone of polymetallic mineral deposits.

Association: Gypsum, opal, diopside (Chile); wulfenite, hemimorphite, chrysocolla, rosasite, iranite, diabolite (Iran).

Distribution: Mina Los Tres Presidentes, Sierra Gorda, Chile; at the Kali Kafi and Chah Khouni mines, Anarak, Iran.

Name: Honors G.F. Herbert Smith (1872-1953), British Museum (Natural History), who discovered paratacamite.
