

Crystal Data: Hexagonal. *Point Group:* $\bar{3} 2/m$. As rhombohedra to 1 mm.

Physical Properties: *Cleavage:* Good $\{10\bar{1}1\}$. *Fracture:* n.d. *Tenacity:* n.d.
Hardness = 3-3.5 D(meas.) = 3.75-3.95 D(calc.) = 3.75

Optical Properties: Transparent. *Color:* Dark green to blue-green. *Streak:* n.d.
Luster: Vitreous.
Optical Class: Uniaxial (-). $\varepsilon = 1.817(2)$ $\omega = 1.825(2)$
Pleochroism: Green to greenish blue, weak. *Absorption:* $O > E$.

Cell Data: *Space Group:* $R\bar{3}m$. $a = 6.834(1)$ $c = 14.075(2)$ $Z = 3$

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:	(1)
CuO	56.1
ZnO	18.2
Cl	17.2
H ₂ O	12.5
-O = Cl ₂	3.9
Total	100.1

(1) Mina Los Tres Presidentes, Chile; average of 5 electron microprobe analyses, H₂O by TGA; corresponding to $\text{Cu}_{3.02}\text{Zn}_{0.96}(\text{OH})_{5.91}\text{H}_{0.03}\text{Cl}_{2.08}$.

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.

Type Material: Natural History Museum, London, England; BM 2003.33.

References: (1) Braithwaite, R.S.W., K. Mereiter, W.H. Paar, and A.M. Clark (2004) Herbertsmithite, $\text{Cu}_3\text{Zn}(\text{OH})_6\text{Cl}_2$, a new species, and the definition of paratacamite. *Mineral. Mag.*, 68, 527-539. (2) (2005) *Amer. Mineral.*, 90, 519 (abs. ref. 1).