

# Teruggite

# Ca<sub>4</sub>MgAs<sub>2</sub>B<sub>12</sub>O<sub>22</sub>(OH)<sub>12</sub>•14H<sub>2</sub>O

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**Crystal Data:** Monoclinic. *Point Group:* 2/m. Acicular [001] to tabular {100} crystals, prismatic {110} with rhomboidal cross-section, to 0.1 mm; aggregated into cauliflower-shaped nodules.

**Physical Properties:** *Cleavage:* On {001}, good; on {110}, fair. *Tenacity:* Brittle. Hardness = 2.5 D(meas.) = 2.149–2.20 D(calc.) = 2.192

**Optical Properties:** Transparent. *Color:* Colorless to white. *Luster:* Vitreous. *Optical Class:* Biaxial (+). *Orientation:* Z = b; X ∧ c = -26°. *Dispersion:* r > v, weak. α = 1.526(1) β = 1.528(1) γ = 1.551(1) 2V(meas.) = 33°

**Cell Data:** *Space Group:* P2<sub>1</sub>/a. a = 15.675(13) b = 19.920(14) c = 6.255(4) β = 99°20(5)' Z = 2

**X-ray Powder Pattern:** Loma Blanca deposit, Argentina. 12.13 (100b), 2.785 (30), 9.98 (22b), 3.577 (22b), 4.65 (21b), 8.37 (20b), 4.571 (17)

| Chemistry:                     | (1)      | (2)    |
|--------------------------------|----------|--------|
| As <sub>2</sub> O <sub>5</sub> | 17.99    | 18.06  |
| B <sub>2</sub> O <sub>3</sub>  | 32.88    | 32.83  |
| MgO                            | 3.17     | 3.17   |
| CaO                            | 17.57    | 17.62  |
| H <sub>2</sub> O <sup>+</sup>  | 25.57    |        |
| H <sub>2</sub> O <sup>-</sup>  | 2.82     |        |
| H <sub>2</sub> O               |          | 28.32  |
| Total                          | [100.00] | 100.00 |

(1) Loma Blanca deposit, Argentina; recalculated to 100% from an original total of 99.94% after deduction of SiO<sub>2</sub> 0.29%; then corresponds to Ca<sub>3.98</sub>Mg<sub>1.00</sub>As<sub>1.99</sub>B<sub>12</sub>O<sub>22</sub>(OH)<sub>12</sub>•14H<sub>2</sub>O.

(2) Ca<sub>4</sub>MgAs<sub>2</sub>B<sub>12</sub>O<sub>22</sub>(OH)<sub>12</sub>•14H<sub>2</sub>O.

**Occurrence:** In lacustrine borate deposits, typically associated with volcanic hot springs and diagenesis of playa sediments.

**Association:** Inyoite, calcite, ulexite, aragonite, realgar, montmorillonite (Loma Blanca deposit, Argentina); colemanite, meyerhofferite, ulexite (Emet deposits, Turkey).

**Distribution:** From the Loma Blanca borate deposit, eight km southwest of Coranzulí, Jujuy Province, Argentina. At the Hisarcık borate mine, near Emet, Kütahya Province. Turkey.

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**Type Material:** Harvard University, Cambridge, Massachusetts, 109056; National Museum of Natural History, Washington, D.C., USA, 145925.

**References:** (1) Aristarain, L.F. and C.S. Hurlbut, Jr. (1968) Teruggite, 4CaO•MgO•6B<sub>2</sub>O<sub>3</sub>•As<sub>2</sub>O<sub>5</sub>•18H<sub>2</sub>O, a new mineral from Jujuy, Argentina. *Amer. Mineral.*, 53, 1815–1827.

(2) Dal Negro, A., I. Kumbasar, and L. Ungaretti (1973) The crystal structure of teruggite. *Amer. Mineral.*, 58, 1034–1043.