

**Crystal Data:** Monoclinic. *Point Group:* 2/m. Equant euhedral crystals to 0.3 mm display {110}, {001}, {010}, and {101}.

**Physical Properties:** *Cleavage:* Good on {001}. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = 2.5 D(meas.) = n.d. D(calc.) = 1.820 Closely resembles melanterite and chalcantite. Quickly dehydrates to cuprian pentahydrate.

**Optical Properties:** Translucent. *Color:* Turquoise-blue. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (-).  $\alpha = 1.462$   $\beta = 1.465$   $\gamma = 1.469$   $2V(\text{meas.}) = 79.8(7)^\circ$   $2V(\text{calc.}) = 82^\circ$  *Dispersion:*  $r > v$ , weak.

**Cell Data:** *Space Group:*  $P2_1/c$ .  $a = 14.166(4)$   $b = 6.534(2)$   $c = 10.838(3)$   $\beta = 105.922(6)^\circ$   $Z = 4$

**X-ray Powder Pattern:** Big Mike mine, Tobin Range, Pershing County, Nevada, USA. 4.850 (100), 3.779 (38), 4.439 (16), 3.663 (15), 3.254 (15), 4.792 (14), 2.721 (14)

**Chemistry:** (1) Big Mike mine, Tobin Range, Pershing County, Nevada, USA; by electron microprobe analysis and TGA; corresponding to  $\text{Mg}_{0.58}\text{Cu}_{0.37}\text{Zn}_{0.02}\text{Mn}_{0.02}\text{Fe}_{0.01}\text{SO}_4 \cdot 7\text{H}_2\text{O}$ .

**Mineral Group:** Melanterite group.

**Occurrence:** An efflorescent secondary mineral, likely widespread and unnoticed in mine wastes that contain copper-bearing sulfides, but in which solubilized  $\text{Fe}^{2+}$  is not available for melanterite crystallization because of oxidation to  $\text{Fe}^{3+}$  in surface waters of near-neutral pH. Natural material collected at relative humidity = 65% and  $T = 4^\circ \text{C}$ .

**Association:** Pickeringite, alunogen, epsomite, gypsum.

**Distribution:** At the Big Mike mine, on the south side of Panther Canyon, on the west flank of the north end of the Tobin Range, Pershing County, north-central Nevada, USA. Likely more widespread and overlooked because of its similar appearance to melanterite and chalcantite.

**Name:** Honors Charles N. *Alpers*, geochemist with the United States Geological Survey, for his contributions to our understanding of the mineralogical controls of mine-water geochemistry.

**Type Material:** Canadian Museum of Nature, Ottawa, Ontario (CNMNC 83921).

**References:** (1) Peterson, R.C., J.M. Hammarstrom, and R.R. Seal, II (2006) Alpersite (Mg,Cu)SO<sub>4</sub>·7H<sub>2</sub>O, a new mineral of the melanterite group, and cuprian pentahydrate: Their occurrence within mine waste. *Amer. Mineral.*, 91, 261-269.