Spangolite  \( \text{Cu}_6\text{Al(SO}_4\text{)Cl(OH)}_{12}\cdot3\text{H}_2\text{O} \)

Crystal Data: Hexagonal. Point Group: 3\( m \). Crystals equant, flattened, or elongated along \([0001]\), to 2 cm, with prominent \( \{00\overline{1}0\} \), equally developed \( \{0\overline{1}0\} \), \( \{01\overline{1}0\} \), \( \{0\overline{1}0\} \), \( \{01\overline{1}0\} \), deeply striated parallel \( \{0001\} \), with additional \( \{\overline{6}\overline{6}\overline{6}\overline{6}\} \) forms, small \( \{0001\} \), in parallel aggregates; may exhibit hemimorphic pyramidal development; cleavable massive. Twinning: On \( \{0001\} \), the acute forms opposite antigonous poles joined to give an hourglasslike shape.

Physical Properties: Cleavage: On \( \{0001\} \), perfect; distinct on \( \{01\overline{1}0\} \), \( \{0\overline{1}0\} \), \( \{0\overline{1}0\} \), \( \{0\overline{1}0\} \). Fracture: Conchoidal. Tenacity: Brittle. Hardness = 2 on \( \{0001\} \), 3 on inclined faces. D( meas. ) = 3.135–3.141 D(calc. ) = 3.14 Pyroelectric.


Cell Data: Space Group: \( P\overline{3}1c. \) \( a = 8.245–8.278 \) \( c = 14.32–14.54 \) \( Z = 2 \)

X-ray Powder Pattern: Tintic district, Utah, USA. 7.07 (10), 3.59 (8), 2.54 (7), 1.80 (7), 1.98 (6), 2.36 (5), 2.66 (4)

Chemistry:

<table>
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<tr>
<th></th>
<th></th>
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<th>( \text{H}_2\text{O} )</th>
<th>Cl</th>
<th>Total</th>
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<tr>
<td>( \text{SO}_3 )</td>
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<td>10.03</td>
<td>20.41</td>
<td>20.32</td>
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<tr>
<td>( \text{Al}_2\text{O}_3 )</td>
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<td>6.39</td>
<td>–O = ( \text{Cl}_2 )</td>
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<tr>
<td>( \text{CuO} )</td>
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<td></td>
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<td>Cl</td>
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<td>4.44</td>
<td></td>
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</table>

(1) Region of Tombstone, Arizona, USA; average of four analyses, three partial; corresponds to \( \text{Cu}_{0.97}\text{Al}_{1.04}\text{(SO}_4\text{)}_{1.00}\text{Cl}_{0.92}\text{(OH)}_{12.14}\cdot2.97\text{H}_2\text{O} \). (2) \( \text{Cu}_6\text{Al(SO}_4\text{)Cl(OH)}_{12}\cdot3\text{H}_2\text{O} \).

Occurrence: A rare secondary mineral in the oxidation zone of hydrothermal copper deposits.

Association: Cuprite, connellite, brochantite, chalcopyllite, cyanotrichite, linarite, caledonite, clinoclase, azurite, malachite, aurichalcite, chrysocolla.

Distribution: Found in many localities in minor amounts. In the USA, in Arizona, the original specimen found “within a radius of 200 miles of Tombstone” [almost certainly from Bisbee]; large crystals in the Copper Queen, Czar, and Southwest mines, Bisbee; in the Maid of Sunshine mine, Courtland, Turquoise district, Cochise Co.; at Metcalf, Clifton-Morenci district, Greenlee Co.; from the Mex-Tex, Blanchard, and Portales mines, near Bingham, Hensonburg district, Socorro Co., and elsewhere in New Mexico; at the Grand Central mine, Tintic district, Juab Co., Utah; in the Majuba Hill mine, Antelope district, Pershing Co., and elsewhere in Nevada. From Wheal Gorland, Gwennap, and the West Caradon mine, St. Cleer, Cornwall, England. At Trébas, Tarn, and Fontana Rossa, Corsica, France. From the Arenas mine, south of Iglesias, Sardinia, Italy. In the Kamariza mine, Laurium, Greece. From Brixlegg, Tirol, Austria. At the Kabasaka and Nyukaku mines, Kyoho Prefecture, Japan. Additional localities are known.

Name: Honors Norman Spang (1842–1922), Etna, Pennsylvania, USA, American mineral collector, who provided the original specimen.


References:


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