Liveingite Pb$_9$As$_{13}$S$_{28}$

Crystal Data: Monoclinic. Point Group: 2. As crystals, elongated and striated along [001], to 5 cm.

Physical Properties: Hardness = 3 VHN = 169–180 (100 g load). D(meas.) = 5.3 D(calc.) = [5.43]

Optical Properties: Opaque. Color: Lead-gray, with deep red internal reflections.

R$_1$–R$_2$: (400) 40.0–43.0, (420) 39.3–42.6, (440) 38.6–42.2, (460) 38.0–41.8, (480) 37.4–41.5, (500) 36.9–41.2, (520) 36.3–40.7, (540) 35.6–40.1, (560) 34.9–39.3, (580) 34.2–38.5, (600) 33.6–37.6, (620) 32.8–36.7, (640) 32.1–35.8, (660) 31.3–34.8, (680) 30.6–34.0, (700) 30.0–33.4

Cell Data: Space Group: P2$_1$. $a = 8.371(5)$ $b = 70.49(5)$ $c = 7.914(5)$ $\beta = 90^\circ8(2)'$
Z = 4

X-ray Powder Pattern: Binntal, Switzerland. (ICDD 31-678).

2.990 (100), 4.11 (90), 3.423 (90), 2.350 (90), 2.093 (90), 1.931 (80), 1.917 (80)

Chemistry:

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<th>Element</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<tr>
<td>Pb</td>
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<td>26.5</td>
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<td>S</td>
<td>24.91</td>
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</table>

Total 99.42 99.6 100.00

(1) Binntal, Switzerland. (2) Do.; by electron microprobe. (3) Pb$_9$As$_{13}$S$_{28}$.

Occurrence: Of hydrothermal origin.

Association: Pyrite, sphalerite.

Distribution: From the Lengenbach quarry, Binntal, Valais, Switzerland [TL].

Name: In honor of George D. Liveing (1827–1924), Professor of Chemistry, Cambridge University, Cambridge, England.

Type Material: n.d.