## Macphersonite $Pb_4(SO_4)(CO_3)_2(OH)_2$



**Crystal Data:** Orthorhombic, pseudohexagonal. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals are commonly pseudohexagonal, thin to tabular on {010}, to 1 cm. *Twinning:* Common, lamellar and contact, composition plane {102}.

**Physical Properties:** *Cleavage:* On {010}, perfect. *Fracture:* Uneven. Hardness = 2.5–3 D(meas.) = 6.50–6.55 D(calc.) = 6.60–6.65 May exhibit a bright yellow fluorescence under SW and LW UV.

**Optical Properties:** Semitransparent. *Color:* Colorless, white, very pale amber.
*Luster:* Adamantine to resinous.
*Optical Class:* Biaxial (–). *Orientation:* $X = b$; $Y = c$; $Z = a$. *Dispersion:* $r > v$, moderate.
$\alpha = 1.87$ $\beta = 2.00$ $\gamma = 2.01$ 2V(meas.) = 35°–36°

**Cell Data:** *Space Group: Pcab.* $a = 10.383(2)$ $b = 23.050(5)$ $c = 9.242(2)$ $Z = 8$

**X-ray Powder Pattern:** Argentolle mine, France; may show preferred orientation.
3.234 (100), 2.654 (90), 3.274 (50), 2.598 (30), 2.310 (30), 2.182 (30), 2.033 (30)

**Chemistry:**

| | (1) | (2) | (3) |
|---|---|---|---|
| $SO_3$ | 6.6 | 7.65 | 7.42 |
| $CO_2$ | 8.8 | 8.47 | 8.16 |
| CuO | 0.1 | | |
| CdO | 0.1 | | |
| PbO | 83.4 | 83.59 | 82.75 |
| $H_2O^+$ | 1.3 | 1.93 | 1.67 |
| Total | 100.3 | 101.64 | 100.00 |

(1) Leadhills, Scotland; by electron microprobe, average of ten analyses, $CO_2$ by evolved gas analysis, $H_2O$ by TGA; corresponds to $(Pb_{4.08}Cu_{0.10}Cd_{0.07})_{\Sigma=4.25}(S_{0.90}O_4)(C_{1.09}O_3)_2(OH)_{1.58}$.
(2) Argentolle mine, France; corresponds to $Pb_{4.06}(S_{1.03}O_4)(C_{1.04}O_3)_2(OH)_{2.32}$.
(3) $Pb_4(SO_4)(CO_3)_2(OH)_2$.

**Polymorphism & Series:** Trimorphous with leadhillite and susannite.

**Occurrence:** An uncommon secondary mineral in the zone of oxidation of lead deposits.

**Association:** Leadhillite, susannite, cerussite, caledonite, pyromorphite, scotlandite, mattheddleite, galena, quartz

**Distribution:** From the Argentolle mine, near Saint-Prix, Saône-et-Loire, France. At Leadhills, Lanarkshire, Scotland. From the Red Gill mine, Caldbeck Fells, Cumbria, England. In the Churfürst Ernst mine, Bönkhausen, North Rhine-Westphalia, Germany. From Laurium, Greece, in slag. Large crystals from Tsumeb, Namibia. At the Moon Anchor mine, Maricopa Co., Arizona, USA.

**Name:** To honor Dr. Harry Gordon Macpherson (1925– ), Keeper of Minerals, Royal Scottish Museum, Edinburgh, Scotland.

**Type Material:** Royal Scottish Museum, Edinburgh, Scotland, 721.34; Museum of Natural History, Geneva, Switzerland, 435/80.

**References:** (1) Livingstone, A. and H. Sarp (1984) Macphersonite, a new mineral from Leadhills, Scotland, and Saint-Prix, France – a polymorph of leadhillite and susannite. Mineral. Mag., 48, 277–282. (2) (1985) Amer. Mineral., 70, 874 (abs. ref. 1). (3) Steele, I.M., J.J. Pluth, and A. Livingstone (1998) Crystal structure of macphersonite ($Pb_4SO_4(CO_3)_2(OH)_2$): comparison with leadhillite. Mineral. Mag., 62, 451–459.