## Koechlinite $Bi_2MoO_6$



**Crystal Data:** Orthorhombic, pseudotetragonal. *Point Group:* $mm2$. As thin, square to rectangular, striated plates and laths flattened on {010}; as spheroidal aggregates of laths, to 0.4 mm. Also as massive or earthy incrustations. *Twinning:* With {101} as twin plane, penetration and contact twins on {101} and contact twins on {010}.

**Physical Properties:** *Cleavage:* {010}, perfect; {0*kl*}, imperfect. *Tenacity:* Very brittle. Hardness = n.d. D(meas.) = n.d. D(calc.) = 8.26

**Optical Properties:** Transparent. *Color:* Greenish yellow, white to light gray; greenish yellow in transmitted light. *Streak:* Pale greenish yellow. *Luster:* Silky.
*Optical Class:* Biaxial (–). *Pleochroism:* Weak; in greenish yellow. *Orientation:* $X = c$; $Y = a$; $Z = b$. *Dispersion:* $r < v$, strong. $\alpha = 2.52$ $\beta = 2.61$ $\gamma = 2.67$ 2V(meas.) = Large.

**Cell Data:** *Space Group:* $Pna2_1$ (synthetic). $a = 5.4822(3)$ $b = 16.1986(8)$ $c = 5.5091(3)$ Z = 4

**X-ray Powder Pattern:** Daniel mine, Schneeberg, Germany.
3.131 (10), 1.647 (9), 1.918 (8), 1.628 (7), 2.733 (6), 1.936 (6), 1.570 (6)

**Chemistry:**

| | (1) | (2) | (3) |
|---|---|---|---|
| $Bi_2O_3$ | 77.1 | 74.96 | 76.40 |
| $MoO_3$ | 22.4 | 25.04 | 23.60 |
| $H_2O$ | 0.2 | | |
| Total | [99.7] | [100.00] | 100.00 |

(1) Daniel mine, Schneeberg, Germany; average of three partial analyses, after deduction of quartz; corresponds to $Bi_{2.06}Mo_{0.97}[O_{5.99}(OH)_{0.01}]_{\Sigma=6.00}$. (2) Torgovsk mine, Russia; recalculated to 100% after removal of ~25% bismuthinite, wulfenite, and quartz; corresponds then to $Bi_{1.92}Mo_{1.04}O_6$. (3) $Bi_2MoO_6$.

**Occurrence:** As a rare alteration product in the oxidation zone of Bi–Mo deposits.

**Association:** Bismuth, skutterudite, quartz (Daniel mine, Schneeberg, Germany); molybdenite, bismuthinite, aikinite, bismite, wulfenite, quartz (Torgovsk mine, Russia).

**Distribution:** In the Daniel mine, Schneeberg, Saxony, and the Clara mine, near Oberwolfach, Black Forest, Germany. From Cínovec (Zinnwald), Czech Republic. At the Sa Duchessa mine, Oridda district, Sardinia, Italy. From the Kerrouchene tungsten mine, Middle Atlas Mountains, Morocco. At the Torgovsk Bi–Mo–W mine, Polar Ural Mountains, Russia. In the USA, at the Outlaw mine, Mariposa Canyon, Round Mountain district, Nye Co., Nevada, and from the Climax mine, Lake Co., Colorado. In Australia, at the Dunallan mine, Coolgardie, and near Poona, Western Australia; and at Bygoo and Elsmore, New South Wales. At the Ebisu mine, Gifu Prefecture, and the Kamo mine, Okayama Prefecture, Japan. From Chilu, Fujian Province, China. Several other minor localities are known.

**Name:** Honors Rudolf Ignatz Koechlin (1862–1939), Austrian mineralogist and Curator of the Vienna Natural History Museum, Vienna, Austria.

**Type Material:** Harvard University, Cambridge, Massachusetts, 64801; National Museum of Natural History, Washington, D.C., USA, R6411, 93646.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1092–1093. (2) Frondel, C. (1943) New data on agricolite, koechlinite, and the bismuth arsenates. Amer. Mineral., 28, 536–540. (3) Yushkin, N.P. (1969) The first find of koechlinite in the USSR. Doklady Acad. Nauk SSSR, 189, 852–855 (in Russian). (4) Teller, R.G., J.F. Brazdil, R.K. Grasselli, and J.D. Jorgensen (1984) The structure of γ-bismuth molybdate, $Bi_2MoO_6$, by powder neutron diffraction. Acta Cryst., C40, 2001–2005.