Molybdenite MoS_2

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Crystal Data: Hexagonal. *Point Group:* $6/m\ 2/m\ 2/m$ ($2H_1$ polytype); or $3m$ (3R polytype). Crystals are commonly tabular, barrel shaped; also as slightly tapered prisms; face development poor; up to 15 cm across. Commonly shows trigonal markings on {0001} parallel to the trace of $\{10\bar{1}1\}$. Foliated, massive, or in scales.

Physical Properties: *Cleavage:* Perfect on {0001}. *Tenacity:* Lamellae flexible, not elastic. Hardness = 1–1.5 VHN = n.d. D(meas.) = 4.62–4.73 D(calc.) = 4.998 Greasy feel.

Optical Properties: Nearly opaque; translucent in thin flakes; transparent in infrared light. *Color:* Lead-gray; very pale yellow to deep reddish brown in transmitted light. *Streak:* Bluish gray. *Luster:* Metallic. *Pleochroism:* Very strong. *Anisotropism:* Very strong.
R_1–R_2: (400) 21.0–55.0, (420) 22.2–54.8, (440) 23.4–54.6, (460) 24.1–53.8, (480) 23.8–52.3, (500) 22.7–49.7, (520) 21.9–47.1, (540) 21.3–45.5, (560) 20.9–44.4, (580) 20.6–44.0, (600) 20.4–44.6, (620) 20.2–45.3, (640) 20.0–45.7, (660) 20.0–45.6, (680) 19.9–45.4, (700) 19.7–44.2

Cell Data: *Space Group:* $P6_3/mmc$ ($2H_1$), with $a = 3.1604$ $c = 12.295$ Z = 2, or *Space Group:* $R3m$ (3R), with $a = 3.16$ $c = 18.33$ Z = 3

X-ray Powder Pattern: Synthetic ($2H_1$).
6.15 (100), 2.277 (45), 1.830 (25), 2.737 (16), 2.049 (14), 1.581 (12), 1.538 (12)

X-ray Powder Pattern: Con mine, Canada (3R).
6.09 (100), 2.71 (70), 1.581 (70), 1.529 (70), 2.63 (60), 2.344 (60), 2.194 (60)

Chemistry: Nearly pure MoS_2.

Polymorphism & Series: Dimorphous with jordisite; polytypes $2H_1$ and 3R are known.

Occurrence: In high-temperature hydrothermal veins. In disseminated deposits of the porphyry type, both with and without associated major copper mineralization. Also in contact metamorphic deposits in limestone with calcium silicate minerals as well as in pegmatites, granites, and aplites. Rarely in meteorites.

Association: Chalcopyrite, other copper sulfides.

Distribution: Of widespread occurrence; the most abundant molybdenum mineral. Fine crystals occur, in the USA, at the Crown Point mine, Lake Chelan, Chelan Co., Washington; and at the Frankford quarry, Philadelphia, Pennsylvania. In Canada, in the Temiskaming district, and in Aldfield Township, Quebec. In Norway, from Raade, near Moss, and at Vennesla, near Arendal. In Russia, in the Adun-Chilon Mountains, south of Nerchinsk, Transbaikal; at Miass, Ilmen Mountains, Southern Ural Mountains; and in the Slundyanogorsk deposit, Central Ural Mountains. In Germany, at Altenberg, Saxony. In Morocco, at Azegour, 80 km southwest of Marrakesh. From Kingsgate and Deepwater, New South Wales, Australia. At the Hirase mine, Gifu Prefecture, Japan. In the Wolak mine, Danyang, Chungchong Province, South Korea. The 3R polytype occurs in the Con mine, Yellowknife, Yukon Territory; and at Mont Saint-Hilaire, Quebec, Canada. From the Yamate mine, Okayama Prefecture, Japan.

Name: A word derived from the Greek *molybdos*, *lead*.

Type Material: 3R, Canadian Geological Survey, Ottawa, Canada, 12112.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 328–331. (2) (1955) NBS Circ. 539, 5, 47. (3) Traill, R.J. (1963) A rhombohedral polytype of molybdenite. Can. Mineral., 7, 524–526.

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