Molybdenum disulfide, MoS₂, forms a gray-black mass which is similar to graphite, both in appearance and to the touch. Like graphite MoS₂ is widely used as solid lubricant. Molybdenum disulfide occurs in nature as molybdenite (crystalline) and as jordisite (amorphous). Metallic molybdenum is produced from molybdenite.

The lubrication properties are due to a layered structure of MoS₂, where the molybdenum atoms are located between layers of sulfur atoms. The sheets of sulfur atoms exhibit only weak van der Waals interaction forces, resulting in a low coefficient of friction.

MoS₂ is diamagnetic and a semiconductor.

Molybdenum disulfide is stable in air or oxygen at normal conditions, but reacts with oxygen upon heating forming molybdenum trioxide:

\[2 \text{MoS}_2 + 9 \text{O}_2 \rightarrow 2 \text{MoO}_3 + 4 \text{SO}_3\]

Chlorine attacks molybdenum disulfide at elevated temperatures to form molybdenum pentachloride:

\[2 \text{MoS}_2 + 7 \text{Cl}_2 \rightarrow 2 \text{MoCl}_5 + 2 \text{S}_2\text{Cl}_2\]

MoS₂ with particle sizes in the range of 0.1-40 µm is a common dry lubricant, offering high lubricity and stability up to 350°C. MoS₂ is also used in ski glide wax.

Molybdenum disulfide was also used in the first rechargeable lithium batteries which have been introduced in the mid-1980s. The cell used lithium metal as the anode and MoS₂ on an aluminum foil as the cathode with LiAsF₆ as electrolyte. Due to the safety problems the batteries have been withdrawn from the market.

MoS₂ is used as a catalyst for desulfurization in petroleum refineries. The catalytic surface is generated in situ by applying H₂S to molybdate/cobalt or nickel-impregnated alumina.

- Hans Lohninger (Epina eBook Team)