



>>>Variant: Molybdenum sulfide (Mo₂S₅)

CAS Registry Number: 12033-34-0

Molecular Formula: Mo₂S₅

Molecular Weight: 352.21

Accurate Mass: 355.671162

Percentage Composition: Mo 54.48%; S 45.52%

Source/Synthesis: Synth. by Zn redn. of 20% H₂SO₄ soln. of ammonium molybdate followed by addition of H₂S

Physical Description: Dark red cryst. + 3H₂O or black solid

Other Data: Loses 1H₂O at 135-140°. Also forms 1.5-sulfohydrate

>>>Variant: Molybdenum sulfide (MoS₃)

Synonym(s): Molybdenum trisulfide

CAS Registry Number: 12033-29-3

Molecular Formula: MoS₃

Molecular Weight: 192.138

Accurate Mass: 193.821616

Percentage Composition: Mo 49.93%; S 50.07%

Source/Synthesis: Synth. by thermal dec. of a tetrathiomolybdate e.g. (NH₄)₂MoS₄ in an inert atm.

Use/Importance: Battery material

Physical Description: Shiny black solid

Solubility: Insol. H₂O, org. solvs.

Other Data: Dec. at about 350° in inert atm. to MoS₂. Oxidises in air above about 200°, giving MoO₃

²⁽⁻⁾_{1/2}

>>>Variant: Molybdenum sulfide (MoS₄)

CAS Registry Number: 12136-77-5

Molecular Formula: MoS₄

Molecular Weight: 224.204

Accurate Mass: 225.793686

Percentage Composition: Mo 42.79%; S 57.21%

tetragonal antiprismatic coord. of Mo atoms by disulfide pairs S₂, as in Patronite (V(S₂)₂) [HWQ84-Y](#)

Source/Synthesis: Synth. from potassium paramolybdate and H₂S, or by thermal dissociation of (NH₄)₂ MoS₁₂·2(H₂O) in vacuum at 300-320°; Li intercalates, Li_xMoS₄ synth. from MoS₄ + *n*-BuLi at r.t.

Use/Importance: Li intercalates have potential applications as cathodic materials in rechargeable batteries with high energy capacities

Physical Description: Dark red translucent powder when freshly prepd., hygroscopic grey powder on drying

References:

Mawroff, F. *et al.*, *Z. Anorg. Allg. Chem.*, 1916, **95**, 189, (*synth*, Mo₂S₅)

Dickinson, R.G. *et al.*, *J.A.C.S.*, 1923, **45**, 1465, (*struct*, MoS₂)

Mellor *Compr. Treat. Inorg. Theor. Chem.*, 1928, **11**, 640, (*rev*)

Bell, H., *J.A.C.S.*, 1957, **79**, 335, (*synth*, MoS₂)

Jellinek, F. *et al.*, *Nature (London)*, 1960, **185**, 376, (*struct*, MoS₂)

Wildervanck, J.C. *et al.*, *Z. Anorg. Allg. Chem.*, 1964, **328**, 309, (*synth*)

Meyer, S.S., *Inorg. Chem.*, 1967, **6**, 1063, (*synth*, Mo₂S₃)

Winer, W.V. *et al.*, *Wear*, 1967, **10**, 422, (*use*)

Young, P.A., *Br. J. Appl. Phys.*, 1968, **1**, 936, (*cryst struct*, MoS₂)

De Jong, R. *et al.*, *J. Solid State Chem.*, 1970, **2**, 88, (*synth*, *struct*, Mo₂S₃)

Souder, A.D. *et al.*, *Can. J. Phys.*, 1972, **50**, 1223, (*semiconduct props*, MoS₂)

Lucovsky, G. *et al.*, *Phys. Rev. B*, 1973, **7**, 3859, (*ir*, MoS₂)

Chevrel, R. *et al.*, *Mater. Res. Bull.*, 1974, **9**, 1487, (*synth*, *struct*, Mo₃Se₂)

Stevens, G.C. *et al.*, *J. Catal.*, 1975, **37**, 544, (*struct*, MoS₂, MoS₃)

Mitchell, P.C.H., *Catalysis*, (Eds., Kemball C., *et al*), Chemical Society, London, 1977, **1**, 204; 1981, **4**, 175, (*catalysts*, MoS₂)

Schoellhorn, R., *Mater. Res. Bull.*, 1977, **12**, 781, (*superconductors*, Mo₃Se₄)

Bullett, D.W., *Phys. Rev. Lett.*, 1977, **39**, 664, (*struct*, Mo₃Se₄)

Tsigdinos, G.A., *Top. Curr. Chem.*, 1978, **76**, 67

Liang, K.S. *et al.*, *J. Non-Cryst. Solids*, 1980, **42**, 345, (*struct*)

Martin, M.J. *et al.*, *Inorg. Chem.*, 1988, **27**, 2804, (*synth*, Mo₂S₃)

Konatzidis, M.G. *et al.*, *Chem. Mater.*, 1993, **5**, 595, (*use*, *nanocomposite synth*, *elect props*, *magnetism*, *powder struct*, MoS₂)

Bonneau, P.R. *et al.*, *Inorg. Chem.*, 1993, **32**, 6084, (*solid solns with WS₂*)

Leist, A. *et al.*, *J. Mater. Chem.*, 1998, **8**, 241-244, (*MoS₂*, *synth*, *powder struct*, *sem*, *uv*, *ir*, *exafs*, *surface studies*)

Khudorozhko, G.F. *et al.*, *J. Phys. Chem. Solids*, 1998, **59**, 283-288, (*MoS₄*, *synth*, *ir*, *struct*, *use*, *x-ray emission spectroscopy*, *x-ray electron spectroscopy*)

Lewis, R.J., *Sax's Dangerous Properties of Industrial Materials*, 8th edn., Van Nostrand Reinhold, 1992, MRD750