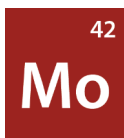


Stable isotopes of molybdenum available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
Mo-92	42	50	91.906810	14.77%	75.00-98.70%	Metal
Mo-92	42	50	91.906810	14.77%	75.00-98.70%	Oxide
Mo-94	42	52	93.905087	9.23%	>98.00%	Metal
Mo-94	42	52	93.905087	9.23%	>98.00%	Oxide
Mo-95	42	53	94.905841	15.90%	≥94.30%	Metal
Mo-95	42	53	94.905841	15.90%	≥94.30%	Oxide
Mo-96	42	54	95.904678	16.68%	>95.00%	Metal
Mo-96	42	54	95.904678	16.68%	>95.00%	Oxide
Mo-97	42	55	96.906020	9.56%	≥96.60%	Metal
Mo-97	42	55	96.906020	9.56%	≥96.60%	Oxide
Mo-98	42	56	97.905407	24.19%	>98.40%	Metal
Mo-98	42	56	97.905407	24.19%	>98.40%	Oxide
Mo-100	42	58	99.907477	9.67%	90.00-99.86%	Metal
Mo-100	42	58	99.907477	9.67%	90.00-99.86%	Oxide



Molybdenum was discovered in 1781 by Carl William Scheele. Its name originates with the Greek word *molybdos*, meaning “lead.” It does not occur free in nature, and it is a necessary trace element in plant nutrition.

Molybdenum is a silvery-white metal or grayish-black powder with a cubic crystalline structure. It has high strength at very high temperatures and oxidizes rapidly above 1000 °F in air at sea level, but it is stable in an upper atmosphere. It is insoluble in hydrochloric or hydrofluoric acids, ammonia, sodium hydroxide, water or dilute sulfuric acid, and soluble in hot concentrated sulfuric or nitric acids. At ordinary temperatures, molybdenum metal is fairly stable to air, water and most mineral acids. The metal shows high resistance to HCl, H₂SO₄, HF and H₃PO₄, and most other mineral acids in the absence of any oxidizing agent. However, the metal is attacked by nitric acid and *aqua regia*.

Molybdenum is very stable to oxygen at ambient temperatures; however, when heated in air or oxygen to red heat, the metal readily converts to trioxide. When bromine vapor is passed over molybdenum metal at 600-700 °C in an atmosphere of nitrogen, the product is trimeric molybdenum dibromide. The metal has very little affinity for hydrogen, even in a finely divided state. When heated with carbon monoxide at temperatures above 1000 °C, no carbonyl is obtained, but a thin film of molybdenum carbide forms over the metal. The metal is used as the starting material to prepare many of its salts.

The largest quantities of molybdenum produced are consumed in the steel industry. The metal is incorporated to impart high resistance and hardness to the steel, as well as to improve its mechanical properties. In the chemical industry, molybdenum compounds are used widely in coloring agents and solid lubricants. Molybdenum compounds are also used as catalysts in many oxidation-reduction reactions and in petroleum refining for production of high-octane gasoline.

Properties of Molybdenum

Name	Molybdenum
Symbol	Mo
Atomic number	42
Atomic weight	95.94
Standard state	Solid at 298° °K
CAS Registry ID	7439-98-7
Group in periodic table	6
Group name	None
Period in periodic table	5
Block in periodic table	d-block
Color	Grey metallic
Classification	Metallic
Melting point	2623 °C
Boiling point	4612 °C
Vaporization point	4639 °C
Thermal conductivity	138 W/(m·K) at 298.2 °K
Electrical resistivity	5.0 μΩ·cm at 0 °C
Electronegativity	1.9
Specific heat	0.25 kJ/kg K
Heat of vaporization	600 kJ·mol ⁻¹ at 4612 °C
Heat of fusion	36 kJ·mol ⁻¹
Density of liquid	9.33 g/cm ⁻³ at 2623 °C
Density of solid	10.28 g/cm ³
Electron configuration	[Kr]4d ⁵ 5s ¹
Atomic radius	1.36 Å (coordination number 8)
Ionic radius	Mo ³⁺ : 0.92 Å and Mo ⁶⁺ : 0.62 Å
Oxidation states	0, +2, +3, +4, +5, +6
Most stable oxidation state	+6
Atomic volume	9.41 cm ³ /mol