

Tungsten

W

General Information

Discovery

Tungsten was discovered by J.J. and F. Elhujar in 1783 in Vergara, Spain. However, in 1779 Woulfe examined the mineral wolframite and concluded it must contain a new element. An alternative name for tungsten is wolfram, from this discovery.

Appearance

Tungsten metal is silvery-white and lustrous, but the element is usually obtained as a grey powder.

Source

The principal tungsten-containing ores are scheelite and wolframite. Commercially, the metal is obtained by reducing tungsten oxide with hydrogen or carbon.

Uses

Tungsten and its alloys are used extensively for filaments for electric lamps, electron tubes and television tubes. As it has the highest melting point of all metals it is used in numerous high-temperature applications. High-speed tool steels contain tungsten, as does a new "painless" dental drill which spins at ultra-high speeds.

Tungsten carbide is immensely hard and is of great importance to the metal-working, mining and petroleum industries.

Calcium and magnesium tungstates are widely used in fluorescent lighting.

Biological Role

Tungsten has no known biological role, and has low toxicity.

General Information

Tungsten has the highest melting point and lowest vapour pressure of all metals, and at temperatures over 1650K has the highest tensile strength. The metal resists attack by oxygen, acids and alkalis.

Physical Information

Atomic Number	74
Relative Atomic Mass (¹² C=12.000)	183.85
Melting Point/K	3680
Boiling Point/K	5930
Density/kg m ⁻³	19300 (293K)
Ground State Electron Configuration	[Xe]4f ¹⁴ 5d ⁴ 6s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-119

Key Isotopes

Nuclide	¹⁸⁰ W	¹⁸² W	¹⁸³ W	¹⁸⁴ W	¹⁸⁵ W	¹⁸⁶ W
Atomic mass	179.9	181.9	183.0	184.0		186.0
Natural abundance	0.10%	26.3%	14.3%	30.7%	0%	28.6%
Half-life	stable	stable	stable	stable	75 days	stable
Nuclide	¹⁸⁷ W					
Atomic mass						
Natural abundance	0%					
Half-life	23.9 h					

Ionisation Energies/kJ mol⁻¹

M - M ⁺	770
M ⁺ - M ²⁺	1700
M ²⁺ - M ³⁺	2300
M ³⁺ - M ⁴⁺	3400
M ⁴⁺ - M ⁵⁺	4600
M ⁵⁺ - M ⁶⁺	5900

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	35.2
Enthalpy of Vaporisation/kJ mol ⁻¹	824.2

Oxidation States

W⁻⁴, W⁻², W⁻¹, W⁰, W⁺², W⁺³, W⁺⁴, W⁺⁵, W⁺⁶