Stable isotopes of tungsten available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
W-180	74	106	179.946706	0.12%	>91.00%	Metal
W-180	74	106	179.946706	0.12%	>91.00%	Oxide
W-182	74	108	181.948205	26.50%	91.50-99.10%	Metal
W-182	74	108	181.948205	26.50%	91.50-99.10%	Oxide
W-183	74	109	182.950224	14.31%	>99.00%	Metal
W-183	74	109	182.950224	14.31%	>98.00%	Oxide
W-184	74	110	183.950932	30.64%	95.00-99.10%	Metal
W-184	74	110	183.950932	30.64%	95.00-99.10%	Oxide
W-186	74	112	185.954362	28.43%	99.79-99.90%	Metal
W-186	74	112	185.954362	28.426%	99.79-99.90%	Oxide

Tungsten was discovered in 1783 by Fausto and Juan José de Elhuyar. Its name derives from the Swedish phrase *tung sten*, meaning “heavy stone.” The origin of the symbol *W* is *wolfram*, named for the tungsten mineral *wolframite*. Tungsten is a grayish-white metal with a body-centered cubic crystalline structure. It is not found in its native form. It has a high electrical conductivity. It oxidizes in air at 400° C, the oxidation rate increasing rapidly with temperature or in the presence of an oxidizing agent such as potassium nitrate, potassium chlorate or lead dioxide. It is insoluble in water and practically insoluble in most acids and alkalis. It dissolves slowly in hot concentrated nitric acid, in saturated aqueous solution of sodium chlorate and basic solution of potassium ferricyanide. It is also solubilized by fusion with sodium hydroxide or sodium carbonate in the presence of potassium nitrate, followed by treatment with water. It is soluble in a mixture of nitric acid and hydrofluoric acid and is corroded by seawater. Compounds of lower oxidation states show alkaline properties and are less stable than those produced in higher oxidation states. Tungsten metal is not affected by aqueous alkalis at room temperature. Although it exhibits a high degree of resistance to most chemicals, it is readily oxidized by a number of oxidizing agents. Tungsten reacts with oxygen at high temperatures, and the finely-divided powder is pyrophoric. It reacts with all halogens and with ammonia at elevated temperatures, forming tungstic nitrides and amides.

Tungsten forms a number of compounds with nonmetals and light metalloid elements. Many are important refractory materials in commerce. In industry, tungsten is a very important metal with wide applications, due to its many outstanding physical properties. Among all the metals, it has the highest melting point and the lowest vapor pressure. At high temperatures it also has the highest tensile strength. The metal has an excellent resistance to corrosion and attack by mineral acids, as well as a thermal expansion comparable to that of borosilicate glass. It is used extensively in alloy steel to impart high strength and hardness. Heavy metal alloys with nickel, copper and iron, produced by powder metallurgy, can be made machineable and moderately ductile for applications as high-density materials. They are used extensively in the tool and die industry for drilling and cutting tools, sand-blasting nozzles, armor-piercing bullets, and studs to increase tire traction. Among nonferrous tungsten alloys, its alloys with copper and silver are used as electrical contacts and switches and with molybdenum in aerospace components. Unalloyed tungsten has several major applications: in electric lamp filaments for light bulbs, as electrodes in arc-welding, in heating elements for high-temperature furnaces, in electron and television tubes, in glass-to-metal seals and in solar energy devices. In its finely divided form, tungsten is highly flammable and may ignite spontaneously.

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Properties of Tungsten

Name	Tungsten
Symbol	W
Atomic number	74
Atomic weight	183.85
Standard state	Solid at 298 ºK
CAS Registry ID	7440-33-7
Group in periodic table	6
Group name	None
Period in periodic table	6
Block in periodic table	d-block
Color	Grayish white, lustrous
Classification	Metallic
Melting point	3422 °C
Boiling point	5900 °C
Vaporization point	5555 °C
Thermal conductivity	173.00 W/(m·K) at 298.2 °K
Electrical resistivity	5.65 μΩ·cm at 27 °C
Electronegativity	1.7
Specific heat	0.13 kJ/kg K
Heat of vaporization	800.00 $kJ \cdot mol^{-1}$
Heat of fusion	35.00 $kJ \cdot mol^{-1}$
Density of liquid	17.60 g/cm^3
Density of solid	19.30 g/cm^3
Electron configuration	$[Xe]4f^{14}5d^4 6s^2$
Atomic radius	1.39 Å
Ionic radius	W^{4+}: 0.66 Å and W^{5+}: 0.62 Å (coordination number 6); W^{6+}: 0.42 Å (coordination number 4)
Oxidation states	0, +2, +3, +4, +5, +6 (+6 is most stable)

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