

General Information

Discovery

Cobalt was discovered by G. Brandt in 1735 in Stockholm, Sweden.

Appearance

Cobalt is a lustrous, silvery-blue, hard metal.

Source

Cobalt is found in the minerals cobaltite, smaltite and erythrite. Important ore deposits are found in Zaire, Morocco and Canada. It is also thought that the floor of the north central Pacific Ocean may have cobalt-rich deposits.

Uses

Cobalt metal is used in electroplating because of its attractive appearance, hardness and resistance to oxidation. It is alloyed with iron, nickel and other metals, and used in jet turbines and gas turbine generators.

Cobalt salts have been used for centuries to produce brilliant blue colours in porcelain, glass, pottery and enamels.

Radioactive cobalt-60 is used in the treatment of cancer.

Biological Role

Cobalt is an essential trace element, and forms part of the active site of vitamin B12. Cobalt salts in small doses have been found to be effective in correcting mineral deficiencies in certain animals. Cobalt in large doses is carcinogenic. Radioactive artificial cobalt-60 is an important gamma-ray source, and is used extensively as a tracer and radiotherapeutic agent.

Physical Information

Atomic Number	27
Relative Atomic Mass ($^{12}\text{C}=12.000$)	58.933
Melting Point/K	1768
Boiling Point/K	3143
Density/kg m ⁻³	8900 (293K)
Ground State Electron Configuration	[Ar]3d ⁷ 4s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	102

Key Isotopes

Nuclide	⁵⁶ Co	⁵⁷ Co	⁵⁸ Co	⁵⁹ Co	⁶⁰ Co
Atomic mass	55.940	56.936	57.936	58.933	59.934
Natural abundance	0%	0%	0%	100%	0%
Half-life	77 days	270 days	71.3 days	stable	5.26 yrs

Ionisation Energies/kJ mol⁻¹

M - M ⁺	760
M ⁺ - M ²⁺	1646
M ²⁺ - M ³⁺	3232
M ³⁺ - M ⁴⁺	4950
M ⁴⁺ - M ⁵⁺	7670
M ⁵⁺ - M ⁶⁺	9840
M ⁶⁺ - M ⁷⁺	12400
M ⁷⁺ - M ⁸⁺	15100
M ⁸⁺ - M ⁹⁺	17900
M ⁹⁺ - M ¹⁰⁺	26600

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	15.2
Enthalpy of Vaporisation/kJ mol ⁻¹	382.4

Oxidation States

Main	Co ^{II}
Others	Co ^{-I} , Co ⁰ , Co ^I , Co ^{III}
	Co ^{IV} , Co ^V

Covalent Bonds/kJ mol⁻¹

Not applicable