

General Information

Discovery

Nickel was discovered by A.F. Cronstedt in 1751 in Stockholm, Sweden.

Appearance

Nickel is a silvery-white metal which is lustrous, malleable and ductile. It is capable of taking on a high polish.

Source

The minerals which contain the most nickel are garnierite and pentlandite. About 30% of these minerals are found in Ontario in North America.

Uses

Nickel is chiefly used in the making of alloys such as stainless steel. A copper-nickel alloy is extensively used in making desalination plants for converting sea water into fresh water.

Nickel steel is used for armour plate.

Nickel has long been used in coins - the US five-cent piece (known as a 'nickel') is 25% nickel and 75% copper. Nickel plate protects softer metals. Finely-divided nickel is used as a catalyst for hydrogenating vegetable oils, and nickel imparts a green colour to glass.

Biological Role

The biological role of nickel is uncertain, but both the metal and nickel sulphide are considered to be carcinogenic. Nickel carbonyl is very toxic.

General Information

Nickel is very resistant to corrosion. It reacts with all acids except concentrated nitric acid, and is not affected by alkalis. It is a fair conductor of heat and electricity.

Physical Information

Atomic Number	28
Relative Atomic Mass ($^{12}\text{C}=12.000$)	58.69
Melting Point/K	1726
Boiling Point/K	3005
Density/kg m ⁻³	8902 (298K)
Ground State Electron Configuration	[Ar]3d ⁸ 4s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-156

Key Isotopes

Nuclide	⁵⁸ Ni	⁵⁹ Ni	⁶⁰ Ni	⁶¹ Ni	⁶² Ni	⁶³ Ni
Atomic mass	57.935	58.934	59.933	60.931	61.928	62.930
Natural abundance	68.27%	0%	26.10%	1.13%	3.59%	0%
Half-life	stable	8x10 ⁴ yrs	stable	stable	stable	92 yrs
Nuclide	⁶⁴ Ni					
Atomic mass	63.928					
Natural abundance	0.91%					
Half-life	stable					

Ionisation Energies/kJ mol⁻¹

M - M ⁺	736.7
M ⁺ - M ²⁺	1753.0
M ²⁺ - M ³⁺	3393
M ³⁺ - M ⁴⁺	5300
M ⁴⁺ - M ⁵⁺	7280
M ⁵⁺ - M ⁶⁺	10400
M ⁶⁺ - M ⁷⁺	12800
M ⁷⁺ - M ⁸⁺	15600
M ⁸⁺ - M ⁹⁺	18600
M ⁹⁺ - M ¹⁰⁺	21660

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	17.6
Enthalpy of Vaporisation/kJ mol ⁻¹	374.8
Oxidation States	
Main	Ni ⁺²
Others	Ni ⁻¹ , Ni ⁰ , Ni ⁺¹ , Ni ⁺³ , Ni ⁺⁴ , Ni ⁺⁶