

Neodymium

Nd

General Information

Discovery

Neodymium was separated from the rare earth didymia by Baron Auer von Welsbach in 1885 in Vienna, Austria. The other principal component of didymia was praseodymium, atomic number 59.

Appearance

Neodymium is a bright silvery-white metal.

Source

The principal sources of most rare earth elements are the minerals monazite and bastnaesite. From these neodymium can be extracted by ion exchange and solvent extraction techniques. The element can also be obtained by reducing the anhydrous chloride with calcium.

Uses

Neodymium is present in misch metal up to 18%. This alloy is used in such products as cigarette lighters where a light flint operates. Neodymium is also a component, along with praseodymium, of didymia, a special glass used in goggles in glass blowing and welding. The element colours glass delicate shades of violet, wine-red and grey. It is used to make glass which transmits the tanning rays of the sun but not the harmful infrared rays.

Biological Role

Neodymium has no known biological role, is moderately toxic and a known eye irritant.

General Information

Neodymium reacts slowly with cold water and quickly with hot water. It quickly tarnishes in air and so is usually kept under paraffin or sealed in plastic.

It exists in two allotropic forms, with a transformation from hexagonal to body-centred cubic taking place at 863K.

Physical Information

Atomic Number	60
Relative Atomic Mass ($^{12}\text{C}=12.000$)	144.24
Melting Point/K	1294
Boiling Point/K	3341
Density/kg m ⁻³	7007 (293K)
Ground State Electron Configuration	[Xe]4f ⁴ 6s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	50

Key Isotopes

Nuclide	¹⁴² Nd	¹⁴³ Nd	¹⁴⁴ Nd	¹⁴⁵ Nd	¹⁴⁶ Nd	¹⁴⁷ Nd
Atomic mass	141.9	142.91	143.9	144.9	145.9	
Natural abundance	27.16%	12.18%	23.80%	8.29%	17.19%	0%
Half-life	stable	stable	stable	stable	stable	11 days
Nuclide	¹⁴⁸ Nd	¹⁵⁰ Nd				
Atomic mass	147.9	149.9				
Natural abundance	5.75%	5.63%				
Half-life	stable	stable				

Ionisation Energies/kJ mol⁻¹

M - M ⁺	529.6
M ⁺ - M ²⁺	1035
M ²⁺ - M ³⁺	2130
M ³⁺ - M ⁴⁺	3899
M ⁴⁺ - M ⁵⁺	
M ⁵⁺ - M ⁶⁺	
M ⁶⁺ - M ⁷⁺	
M ⁷⁺ - M ⁸⁺	
M ⁸⁺ - M ⁹⁺	
M ⁹⁺ - M ¹⁰⁺	

Other Information

Enthalpy of Fusion/kJ mol⁻¹ 7.11

Enthalpy of Vaporisation/kJ mol⁻¹ 328

Oxidation States

Main Nd^{III}

Others Nd^{II}, Nd^{IV}

Covalent Bonds/kJ mol⁻¹

Not applicable