

Rhodium

Rh

General Information

Discovery

Rhodium was discovered by W.H. Wollaston in 1803 in London.

Appearance

Rhodium is a lustrous, silvery, hard metal.

Source

Rhodium occurs native with other platinum metals in river sands in North and South America, and in the copper-nickel sulphide ores of Ontario. Although the quantity occurring here is very small, the large amounts of nickel processed make the extraction of rhodium as a by-product commercially feasible.

Uses

The major use of rhodium is as a hardener for platinum and palladium, to produce alloys used for electrodes, furnace windings, crucibles and thermocouple elements. It is used as an electrical contact material as it has a low resistance and is highly resistant to corrosion. Plated rhodium is exceptionally hard and is used for optical instruments. It is also used as a catalyst.

Biological Role

Rhodium has no known biological role, but is a suspected carcinogen.

General Information

Rhodium is inert to all acids but attacked by fused alkalis. It is stable in air up to 875K.

Physical Information

Atomic Number	45
Relative Atomic Mass ($^{12}\text{C}=12.000$)	102.91
Melting Point/K	2239
Boiling Point/K	4000
Density/kg m ⁻³	12410 (293K)
Ground State Electron Configuration	[Kr]4d ⁸ 5s ¹
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-162

Key Isotopes

Nuclide	¹⁰³ Rh	¹⁰⁵ Rh
Atomic mass	102.91	
Natural abundance	100%	0%
Half-life	stable	35.88 h

Ionisation Energies/kJ mol⁻¹

M - M ⁺	720
M ⁺ - M ²⁺	1744
M ²⁺ - M ³⁺	2997
M ³⁺ - M ⁴⁺	4400
M ⁴⁺ - M ⁵⁺	6500
M ⁵⁺ - M ⁶⁺	8200
M ⁶⁺ - M ⁷⁺	10100
M ⁷⁺ - M ⁸⁺	12200
M ⁸⁺ - M ⁹⁺	14200
M ⁹⁺ - M ¹⁰⁺	22000

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	21.55
Enthalpy of Vaporisation/kJ mol ⁻¹	494.3

Oxidation States

Main	Rh ⁺³
Others	Rh ⁻¹ , Rh ⁰ , Rh ⁺¹ , Rh ⁺² , Rh ⁺⁴ , Rh ⁺⁵ , Rh ⁺⁶