

Rhenium

Re

General Information

Discovery

Rhenium was discovered by W. Noddack, I. Tacke and O. Berg in 1925 in Berlin, Germany.

Appearance

Rhenium is a silvery metal which is usually obtained as a grey powder.

Source

Rhenium does not occur free in nature or as a compound in a mineral species. It is, however, widely spread throughout the earth's crust to the extent of about 0.001 parts per million. Commercial production of rhenium is by extraction from the flue dusts of molybdenum smelters.

Uses

Rhenium is used as an additive to tungsten and molybdenum-based alloys to impart useful properties. It is widely used for filaments for mass spectrographs. It is also used as an electrical contact material as it has good wear resistance and withstands arc corrosion. Rhenium catalysts are exceptionally resistant to poisoning and are used for the hydrogenation of fine chemicals.

Biological Role

Rhenium has no known biological role.

General Information

Rhenium resists corrosion and oxidation but slowly tarnishes in moist air. It dissolves in nitric and sulphuric acids.

Physical Information

Atomic Number	75
Relative Atomic Mass ($^{12}\text{C}=12.000$)	186.2
Melting Point/K	3453
Boiling Point/K	5900
Density/kg m ⁻³	21020 (293K)
Ground State Electron Configuration	[Xe]4f ¹⁴ 5d ⁵ 6s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	37

Key Isotopes

Nuclide	¹⁸⁵ Re	¹⁸⁶ Re	¹⁸⁷ Re	¹⁸⁸ Re
Atomic mass	184.9		186.9	
Natural abundance	37.4%	0%	62.6%	0%
Half-life	stable	88.9 h	4x10 ¹⁰ yrs	16.7 h

Ionisation Energies/kJ mol⁻¹

M - M ⁺	760
M ⁺ - M ²⁺	1260
M ²⁺ - M ³⁺	2510
M ³⁺ - M ⁴⁺	3640
M ⁴⁺ - M ⁵⁺	4900
M ⁵⁺ - M ⁶⁺	6300
M ⁶⁺ - M ⁷⁺	7600
M ⁷⁺ - M ⁸⁺	
M ⁸⁺ - M ⁹⁺	
M ⁹⁺ - M ¹⁰⁺	

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	33.1
Enthalpy of Vaporisation/kJ mol ⁻¹	704.25

Oxidation States

Main	Re ^{III} , Re ^{IV} , Re ^V
Others	Re ^{-III} , Re ^{-I} , Re ^O , Re ^I , Re ^{II} , Re ^{VI} , Re ^{VII}

Covalent Bonds/kJ mol⁻¹

Not applicable