Bismuth Bi

General Information

Discovery

Bismuth has been known since the fifteenth century, although it was often confused with tin and lead. Claude Geoffrey the Younger showed it to be distinct from lead in 1753.

Appearance

Bismuth is a white brittle metal with a pinkish tinge.

Source

Bismuth occurs as the native metal, and in ores such as bismuthinite and bismite. The major commercial source of bismuth is as a by-product of refining lead, copper, tin, silver and gold ores.

Uses

Bismuth is used in low-melting alloys with tin and cadmium, which are used in products such as fire detectors and extinguishers, electric fuses and solders.

Biological Role

Bismuth has no known biological role, and is non-toxic.

General Information

Bismuth is stable to oxygen and water, and dissolves in concentrated nitric acid. Its soluble salts are characterised by forming insoluble basic salts on the addition of water.

Physical Information

Atomic Number	83
Relative Atomic Mass (^{12}C=12.000)	208.98
Melting Point/K	545
Boiling Point/K	1833
Density/kg m^{-3}	9747 (293K)
Ground State Electron Configuration	$[Xe]4f^{14}5d^{10}6s^{2}6p^{3}$
Electron Affinity (M-M^{-})/kJ mol^{-1}	-101

Key Isotopes

Nuclide	^{206}Bi	^{207}Bi	^{209}Bi
Atomic mass			208.98
Natural abundance	0%	0%	100%
Half-life	6.3 days	30.2 yrs	stable

Ionisation Energies/kJ mol^{-1}

M - M^{+}	703.2
M^{+} - M^{2+}	1610
M^{2+} - M^{3+}	2466
M^{3+} - M^{4+}	4372
M^{4+} - M^{5+}	5400
M^{5+} - M^{6+}	8520
M^{6+} - M^{7+}	10300
M^{7+} - M^{8+}	12300
M^{8+} - M^{9+}	14300
M^{9+} - M^{10+}	16300

Other Information

Enthalpy of Fusion/kJ mol^{-1}	10.48
Enthalpy of Vaporisation/kJ mol^{-1}	179.1

Oxidation States

Main	Bi^{+3}
Others	Bi^{-3}, Bi^{+1}, Bi^{+4}

Covalent Bonds/kJ mol^{-1}

Bi - H	194
Bi - C	143
Bi - O	339
Bi - F	314
Bi - Cl	285
Bi - Bi	200