

Antimony

Sb

General Information

Discovery

Antimony was probably known to ancient civilisations, and was certainly known as a metal at the beginning of the 17th century.

Appearance

Antimony exists as two allotropes, of which the metal is the usual form. This is extremely brittle, with a bright silvery colour and a hard, crystalline nature. The second allotropic form is a grey powder.

Source

Antimony is not an abundant element but is found in small quantities in over 100 mineral species. It can be found as the native metal, but more frequently as antimony(III) sulfide from which it is extracted for commercial use. This is done by roasting the antimony(III) sulfide to the oxide, and then reducing with carbon or iron.

Uses

Antimony is widely used in alloys, especially with lead in order to improve its hardness and mechanical strength, and in this form is used in batteries. Antimony is also used in semiconductor technology in making infra-red detectors and diodes. Other uses include type metal, bullets and cable sheathing.

Antimony compounds are used in manufacturing flame-proof compounds, paints, enamels, glass and pottery.

Biological Role

Antimony and many of its compounds are toxic.

General Information

Antimony exists as two allotropic forms. The normal form is metallic and stable; the other is known as the amorphous grey form.

Antimony is stable in air and is not attacked by dilute acids or alkalis. It is not acted upon by air at room temperature, but burns brilliantly when heated with the formation of white fumes of antimony(III) oxide.

Physical Information

Atomic Number	51
Relative Atomic Mass ($^{12}\text{C}=12.000$)	121.75
Melting Point/K	904
Boiling Point/K	1908
Density/kg m ⁻³	6691 (293K)
Ground State Electron Configuration	[Kr]4d ¹⁰ 5s ² 5p ³
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-101

Key Isotopes

Nuclide	¹²¹ Sb	¹²² Sb	¹²³ Sb	¹²⁴ Sb	¹²⁵ Sb
Atomic mass	120.9		122.93		
Natural abundance	57.3%	0%	42.7%	0%	0%
Half-life	stable	2.8 days	stable	60.4 days	2.71 yrs

Ionisation Energies/kJ mol⁻¹

M - M ⁺	833.7
M ⁺ - M ²⁺	1794
M ²⁺ - M ³⁺	2443
M ³⁺ - M ⁴⁺	4260
M ⁴⁺ - M ⁵⁺	5400
M ⁵⁺ - M ⁶⁺	10400
M ⁶⁺ - M ⁷⁺	12700
M ⁷⁺ - M ⁸⁺	15200
M ⁸⁺ - M ⁹⁺	17800
M ⁹⁺ - M ¹⁰⁺	20400

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	20.9
Enthalpy of Vaporisation/kJ mol ⁻¹	165.8

Oxidation States

Main	Sb ⁺³ , Sb ⁺⁵
Others	Sb ⁻³

Covalent Bonds/kJ mol⁻¹

Sb - H	257
Sb - C	215
Sb - O	314
Sb - F	389
Sb - Cl	313
Sb - Sb	299