

# 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) sulphide from which it is extracted for commercial use. This is done by roasting the antimony (III) sulphide 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	903.9
Boiling Point/K	1908
Density/kg m <sup>-3</sup>	6691 (293K)
Ground State Electron Configuration	[Kr]4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>3</sup>
Electron Affinity (M-M <sup>-</sup> )/kJ mol <sup>-1</sup>	101

## Key Isotopes

Nuclide	<sup>121</sup> Sb	<sup>122</sup> Sb	<sup>123</sup> Sb	<sup>124</sup> Sb	<sup>125</sup> 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<sup>-1</sup>

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

## Other Information

Enthalpy of Fusion/kJ mol<sup>-1</sup> 20.9

Enthalpy of Vaporisation/kJ mol<sup>-1</sup> 165.8

### Oxidation States

Main Sb<sup>III</sup>, Sb<sup>V</sup>

Others Sb<sup>-III</sup>

### Covalent Bonds/kJ mol<sup>-1</sup>

Sb - H 257

Sb - C 215

Sb - O 314

Sb - F 389

Sb - Cl 313

Sb - Sb 299