

Bromine

Br

General Information

Discovery

Bromine was discovered by A.J. Balard in 1826 in Montpellier, France.

Appearance

Bromine is a red, dense liquid with a sharp, distinctive smell.

Source

Bromine is extracted from natural brine deposits in the USA and elsewhere. It was the first compound to be extracted from seawater but this is no longer economically viable as seawater contains only 65 parts per million of bromine.

Uses

Bromine is used in many areas such as agricultural chemicals, dyestuffs, chemical intermediates and flame-retardants. Most is used to prepare 1,2-di-bromoethane which is used as an anti-knock agent in combustion engines.

Biological Role

Bromine has no known biological role. It has an irritating effect on the eyes and throat, and produces painful sores when in contact with the skin.

General Information

Bromine combines readily with many elements. Like chlorine, it has a natural bleaching action.

Physical Information

Atomic Number	35
Relative Atomic Mass ($^{12}\text{C}=12.000$)	79.904
Melting Point/K	265.9
Boiling Point/K	331.9
Density/kg m ⁻³	3122 (293K)
Ground State Electron Configuration	[Ar]3d ¹⁰ 4s ² 4p ⁵
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	324

Key Isotopes

Nuclide	⁷⁷ Br	⁷⁹ Br	⁸¹ Br	⁸² Br
Atomic mass		78.918	80.916	81.917
Natural abundance	0%	50.69%	49.31%	0%
Half-life	57 h	stable	stable	35.5 h

Ionisation Energies/kJ mol⁻¹

M - M ⁺	1139.9
M ⁺ - M ²⁺	2104
M ²⁺ - M ³⁺	3500
M ³⁺ - M ⁴⁺	4560
M ⁴⁺ - M ⁵⁺	5760
M ⁵⁺ - M ⁶⁺	8550
M ⁶⁺ - M ⁷⁺	9940
M ⁷⁺ - M ⁸⁺	18600
M ⁸⁺ - M ⁹⁺	23900
M ⁹⁺ - M ¹⁰⁺	28100

Other Information

Enthalpy of Fusion/kJ mol⁻¹ 10.8

Enthalpy of Vaporisation/kJ mol⁻¹ 30.5

Oxidation States

Main Br^I, Br^V

Others Br^I, Br^{III}, Br^{IV}, Br^{VII}

Covalent Bonds/kJ mol⁻¹

Br - H 366

Br - C 285

Br - O 234

Br - F 285

Br - Br 193

Br - B 410

Br - Si 310

Br - P 264