

Bromine - Br

Chemical properties of bromine - Health effects of bromine - Environmental effects of bromine

Atomic number	35
Atomic mass	79.904 g.mol ⁻¹
Electronegativity according to Pauling	2.8
Density	3.1 g.cm ⁻³ at 20°C
Melting point	- 7.2 °C
Boiling point	58.8 °C
Vanderwaals radius	0.165 nm
Ionic radius	0.195 nm (-1)
Isotopes	10
Electronic shell	[Ar] 3d ¹⁰ 4s ² 4p ⁵
Energy of first ionisation	1142.7 kJ.mol ⁻¹
Standard potential	1.08 V
Discovered by	Anthoine Balard in 1826



Bromine

At ambient temperature bromine is a brownish-red liquid. It has a similarly colored vapor with an offensive and suffocating odor. It is the only nonmetallic element that is liquid under ordinary conditions, it evaporates easily at standard temperature and pressures in a red vapor that has a strong disagreeable odor resembling that of chlorine. Bromine is less active chemically than chlorine and fluorine but is more active than iodine; its compounds are similar to those of the other halogens. Bromine is soluble in organic solvents and in water.

Applications

Bromine is used in industry to make organobromo compounds. A major one was dibromoethane an agent for leaded gasoline, before they were largely phased out due to environmental considerations. Other organobromines are used as insecticides, in fire extinguishers and to make pharmaceuticals. Bromine is used in making fumigants, dyes, flameproofing agents, water purification compounds, sanitizes, medicinals, agents for photography and in brominated vegetable oil, used as emulsifier in many citrus-flavoured soft drinks.

Bromine in the environment

Bromine is a naturally occurring element that can be found in many inorganic substances. Humans however, have many years ago started the introduction of organic bromines in the environment. These are all compounds that are not natural and can cause serious harm to human health and the environment.

In diffuse crustal rock bromine naturally occurs as bromide salts. Bromine salts have accumulated in sea water (85 ppm), from which bromine is extracted.

World production of bromine is more than 300.000 tonnes per year; the three main producing countries are US, Israel and the UK. In this last case it is extracted from sea water at a plant on the coast of Anglesey, Wales.

Health effects of bromine

Bromine is corrosive to human tissue in a liquid state and its vapors irritate eyes and throat. Bromine vapors are very toxic with inhalation.

Humans can absorb organic bromines through the skin, with food and during breathing. Organic bromines are widely used as sprays to kill insects and other unwanted pests. But they are not only poisonous to the animals that they are used against, but also to larger animals. In many cases they are poisonous to humans, too. The most important health effects that can be caused by bromine-containing organic contaminants are malfunctioning of the nervous system and disturbances in genetic materials.

But organic bromines can also cause damage to organs such as liver, kidneys, lungs and milt and they can cause stomach and gastrointestinal malfunctioning. Some forms of organic bromines, such as ethylene bromine, can even cause cancer.

Inorganic bromines are found in nature, but whereas they occur naturally humans have added too much through the years. Through food and drinking water humans absorb high doses of inorganic bromines. These bromines can damage the nervous system and the thyroid gland.

Environmental effects of bromine

Organic bromines are often applied as disinfecting and protecting agents, due to their damaging effects on microorganisms. When they are applied in greenhouses and on farmland they can easily rinse off to surface water, which has very negative health effects on daphnia, fishes, lobsters and algae.