

# Iodine - I

## Chemical properties of iodine - Health effects of iodine - Environmental effects of iodine

Atomic number	53
Atomic mass	126.9045 g.mol <sup>-1</sup>
Electronegativity according to Pauling	2.5
Density	4.93 g.cm <sup>-3</sup> at 20°C
Melting point	114 °C
Boiling point	184 °C
Vanderwaals radius	0.177 nm
Ionic radius	0.216 nm (-1) ; 0.05 nm (+7)
Isotopes	15
Electronic shell	[ Kr ] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>5</sup>
Energy of first ionisation	1008.7 kJ.mol <sup>-1</sup>
Standard potential	+ 0.58 V ( I <sub>2</sub> / I <sup>-</sup> )
Discovered	Bernard Courtois in 1811



## Iodine

Iodine is a non-metallic, dark-gray/purple-black, lustrous, solid element. Iodine is the most electropositive halogen and the least reactive of the halogens even if it can still form compounds with many elements. Iodine sublime easily on heating to give a purple vapour. Iodine dissolves in some solvents, such as carbon tetrachloride and it is only slightly soluble in water.

### Applications

Iodine is used in medical treatment as tincture and iodoform, it is employed in the preparation of certain drugs and in the manufacture of some printing inks and dyes. Silver iodine is used in photography. Iodine is added to almost all the table salt and is used as a supplement to animal feed. It is also an ingredient of water purification tablets that are used for drinking water preparation.

For many of these uses iodine is turned into iodides.

### Iodine in the environment

Iodine is added to nearly any kind of salt that is applied. It is an ingredient of bread, sea fish and oceanic plants. Iodine is naturally present in the ocean and some sea fish and water plants will store it in their tissues.

Iodine can be found naturally in air, water and soil. The most important sources of natural iodine are the oceans. About 400.000 tonnes of iodine escape from the oceans every year as iodide in sea spray or as iodide, hydrochloric acid and methyl iodide, produced by marine organisms. Much of it is deposited on land where it may become part of the biocycle.

There are some iodine-containing minerals, such as alutarite, found in Chile and iodargyte, found in Colorado, Nevada and New Mexico. World-wide industrial production of iodine is about 13.000 tonnes per year, mainly in Chile and Japan, plus small amounts in Russia and USA. Iodine is extracted from natural brines and oil brines, which have up to 100 ppm of the element or from Chilean nitrate deposits. Known reserves of easily accessible iodine amount is around 2 million tonnes.

## Health effects of iodine

Many medicines and cleansers for skin wounds contain iodine.

Iodine is a building material of thyroid hormones that are essential for growth, the nervous system and the metabolism. Humans that eat little to no bread can experience iodine shortages. The function of the thyroid gland will then slow down and the thyroid gland will start swelling up. This phenomenon is called struma. This condition is rare now as table salt is dosed with a little iodide. Large quantities of iodine can be dangerous because the thyroid gland will labour too hastily. This affects the entire body; it causes disturbed heartbeats and loss of weight.

Elemental iodine, I<sub>2</sub>, is toxic, and its vapour irritates the eyes and lungs. The maximum allowable concentration in air when working with iodine is just 1 mg m<sup>-3</sup>. All iodides are toxic if taken in excess.

Iodine 131 is one of the radionuclides involved in atmospheric testing of nuclear weapons, which began in 1945, with a US test, and ended in 1980 with a Chinese test. It is among the long-lived radionuclides that have produced and will continue to produce increased cancer risk for decades and centuries to come. Iodine 131 increases the risk of cancer and possibly other diseases of the thyroid and those caused by thyroid hormonal deficiency.

## Environmental effects of iodine

Iodine in air can combine with water particles and precipitate into water or soils. Iodine in soils will combine with organic matter and remain in the same place for a long time.