

Chlorine - Cl

Chemical properties of chlorine - Health effects of chlorine - Environmental effects of chlorine

Atomic number	17
Atomic mass	35.453 g.mol ⁻¹
Electronegativity according to Pauling	3.0
Density	3.21*10 ⁻³ g.cm ⁻³ at 20 °C
Melting point	-101 °C
Boiling point	-34.6 °C
Vanderwaals radius	0.127 nm
Ionic radius	0.184 (-2) nm ; 0.029 nm (+6)
Isotopes	4
Electronic shell	[Ne] 3s ² 3p ⁵
Energy of first ionisation	1255.7 kJ.mol ⁻¹
Energy of second ionisation	2298 kJ.mol ⁻¹
Energy of third ionisation	3822 kJ.mol ⁻¹
Standard potential	- 1.36 V
Discovered by	Carl Wilhelm Scheele in 1774



Chlorine

Discovered in 1774 by Carl Wilhelm Scheele, who mistakenly thought it contained oxygen. Chlorine was given its name in 1810 by Humphry Davy, who insisted that it was in fact an element.

The pure chemical element has the physical form of a diatomic green gas. The name chlorine is derived from chloros, meaning green, referring to the color of the gas. Chlorine gas is two and one half times as heavy as air, has an intensely disagreeable suffocating odor, and is exceedingly poisonous. In its liquid and solid form it is a powerful oxidizing, bleaching, and disinfecting agent.

This element is a part of the halogen series forming salts. It is extracted from chlorides through oxidation and electrolysis. Chlorine gas is greenish-yellow and combines readily with nearly all other elements.

Applications

Chlorine is an important chemical in water purification, in disinfectants, in bleach and in mustard gas.

Chlorine is also used widely in the manufacture of many products and items directly or indirectly, i.e. in paper product production, antiseptic, dyestuffs, food, insecticides, paints, petroleum products, plastics, medicines, textiles, solvents, and many other consumer products. It is used to kill bacteria and other microbes from drinking water supplies.

Chlorine is involved in bleaching wood pulp for paper making, bleach is also used industrially to remove ink from recycle paper.

Chlorine often imparts many desired properties in an organic compound when it is substituted for hydrogen (synthetic rubber), so it is widely used in organic chemistry, in the production of chlorates, chloroform, carbon tetrachloride, and in the bromine extraction.

Chlorine in the environment

In nature it is only found combined with other elements chiefly sodium in the form of common salt (NaCl), but also in carnallite, and sylvite. Chlorides make up much of the salt dissolved in the earth's oceans: about 1.9 % of the mass of seawater is chloride ions.

The amount of chloride in soils varies according to the distance from the sea. The average in top soils is about 10 ppm. Plants contain various amount of chlorine; it is an essential micro-nutrient for higher plants where it concentrates in the chloroplasts. Growth suffers if the amount of chloride in the soil falls below 2 ppm, but it rarely happens. The upper limit of tolerance varies according to the crop.

Health effects of chlorine

Chlorine is a highly reactive gas. It is a naturally occurring element. The largest users of chlorine are companies that make ethylene dichloride and other chlorinated solvents, polyvinyl chloride (PVC) resins, chlorofluorocarbons, and propylene oxide. Paper companies use chlorine to bleach paper. Water and wastewater treatment plants use chlorine to reduce water levels of microorganisms that can spread disease to humans (disinfection).

Exposure to chlorine can occur in the workplace or in the environment following releases to air, water, or land. People who use laundry bleach and swimming pool chemicals containing chlorine products are usually not exposed to chlorine itself. Chlorine is generally found only in industrial settings.