

Iron - Fe

Chemical properties of iron - Health effects of iron - Environmental effects of iron

Atomic number	26
Atomic mass	55.85 g.mol ⁻¹
Electronegativity according to Pauling	1.8
Density	7.8 g.cm ⁻³ at 20°C
Melting point	1536 °C
Boiling point	2861 °C
Vanderwaalsradius	0.126 nm
Ionic radius	0.076 nm (+2) ; 0.064 nm (+3)
Isotopes	8
Electronic shell	[Ar] 3d ⁶ 4s ²
Energy of first ionisation	761 kJ.mol ⁻¹
Energy of second ionisation	1556.5 kJ.mol ⁻¹
Energy of third ionisation	2951 kJ.mol ⁻¹
Standard potential	- 0.44 V (Fe ²⁺ / Fe) ; 0.77 V (Fe ³⁺ / Fe ²⁺)
Discovered by	The ancients



Iron

Iron is a lustrous, ductile, malleable, silver-gray metal (group VIII of the periodic table). It is known to exist in four distinct crystalline forms. Iron rusts in damp air, but not in dry air. It dissolves readily in dilute acids. Iron is chemically active and forms two major series of chemical compounds, the bivalent iron (II), or ferrous, compounds and the trivalent iron (III), or ferric, compounds.

Applications

Iron is the most used of all the metals, including 95 % of all the metal tonnage produced worldwide. Thanks to the combination of low cost and high strength it is indispensable. Its applications go from food containers to family cars, from screwdrivers to washing machines, from cargo ships to paper staples.

Steel is the best known alloy of iron, and some of the forms that iron takes include: pig iron, cast iron, carbon steel, wrought iron, alloy steels, iron oxides.

Iron in the environment

Iron is believed to be the tenth most abundant element in the universe. Iron is also the most abundant (by mass, 34.6%) element making up the Earth; the concentration of iron in the various layers of the Earth ranges from high at the inner core to about 5% in the outer crust. Most of this iron is found in various iron oxides, such as the minerals hematite, magnetite, and taconite. The earth's core is believed to consist largely of a metallic iron-nickel alloy.

Iron is essential to almost living things, from micro-organisms to humans.

World production of new iron is over 500 million tonnes a year, and recycled iron add other 300 million tonnes. Economically workable reserves of iron ores exceed 100 billion tonnes. The main mining areas are China, Brazil, Australia, Russia and Ukraine, with sizeable amounts mined in the USA, Canada, Venezuela, Sweden and India.

Health effects of iron

Iron can be found in meat, whole meal products, potatoes and vegetables. The human body absorbs iron in animal products faster than iron in plant products. Iron is an essential part of hemoglobin; the red colouring agent of the blood that transports oxygen through our bodies.

Iron may cause conjunctivitis, choroiditis, and retinitis if it contacts and remains in the tissues. Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in development of a benign pneumoconiosis, called siderosis, which is observable as an x-ray change. No physical impairment of lung function has been associated with siderosis. Inhalation of excessive concentrations of iron oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. LD50 (oral, rat) =30 gm/kg. (LD50: Lethal dose 50. Single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation. Usually expressed as milligrams or grams of material per kilogram of animal weight (mg/kg or g/kg).)

A more common problem for humans is iron deficiency, which leads to anaemia. A man needs an average daily intake of 7 mg of iron and a woman 11 mg; a normal diet will generally provide all that is needed.