Lead - Pb

Chemical properties of lead - Health effects of lead - Environmental effects of lead

Atomic number	82
Atomic mass	207.2 g.mol $^{-1}$
Electronegativity according to Pauling	1.8
Density	11.34 g.cm^{-3} at 20°C
Melting point	327 °C
Boiling point	1755 °C
Vanderwaals radius	0.154 nm
Ionic radius	0.132 nm (+2) ; 0.084 nm (+4)
Isotopes	13
Electronic shell	[Xe] 4f^{14} 5d^{10} 6s^{2} ^{6p2}
Energy of first ionisation	715.4 kJ.mol $^{-1}$
Energy of second ionisation	1450.0 kJ.mol $^{-1}$
Energy of third ionisation	3080.7 kJ.mol $^{-1}$
Energy of fourth ionisation	4082.3 kJ.mol $^{-1}$
Energy of fifth ionisation	6608 kJ.mol $^{-1}$
Discovered by	The ancients

Lead

Lead is a bluish-white lustrous metal. It is very soft, highly malleable, ductile, and a relatively poor conductor of electricity. It is very resistant to corrosion but tarnishes upon exposure to air. Lead isotopes are the end products of each of the three series of naturally occurring radioactive elements.

Applications

Lead pipes bearing the insignia of Roman emperors, used as drains from the baths, are still in service. Alloys include pewter and solder. Tetraethyl lead ($PbEt_4$) is still used in some grades of petrol (gasoline) but is being phased out on environmental grounds.
Lead is a major constituent of the lead-acid battery used extensively in car batteries. It is used as a coloring element in ceramic glazes, as projectiles, in some candles to threat the wick. It is the traditional base metal for organ pipes, and it is used as electrodes in the process of electrolysis. One if its major uses is in the glass of computer and television screens, where it shields the viewer from radiation. Other uses are in sheeting, cables, solders, lead crystal glassware, ammunitions, bearings and as weight in sport equipment.

Lead in the environment

Native lead is rare in nature. Currently lead is usually found in ore with zinc, silver and copper and it is extracted together with these metals. The main lead mineral in Galena (PbS) and there are also deposits of cerrussite and anglesite which are mined. Galena is mined in Australia, which produces 19% of the world's new lead, followed by the USA, China, Peru' and Canada. Some is also mined in Mexico and West Germany. World production of new lead is 6 million tonnes a year, and workable reserves total are estimated 85 million tonnes, which is less than 15 year's supply.

Lead occurs naturally in the environment. However, most lead concentrations that are found in the environment are a result of human activities. Due to the application of lead in gasoline an unnatural lead-cycle has consisted. In car engines lead is burned, so that lead salts (chlorines, bromines, oxides) will originate.
These lead salts enter the environment through the exhausts of cars. The larger particles will drop to the ground immediately and pollute soils or surface waters, the smaller particles will travel long distances through air and remain in the atmosphere. Part of this lead will fall back on earth when it is raining. This lead-cycle caused by human production is much more extended than the natural lead-cycle. It has caused lead pollution to be a worldwide issue.

Health effects of lead

Lead is a soft metal that has known many applications over the years. It has been used widely since 5000 BC for application in metal products, cables and pipelines, but also in paints and pesticides. Lead is one out of four metals that have the most damaging effects on human health. It can enter the human body through uptake of food (65%), water (20%) and air (15%).

Foods such as fruit, vegetables, meats, grains, seafood, soft drinks and wine may contain significant amounts of lead. Cigarette smoke also contains small amounts of lead.

Lead can enter (drinking) water through corrosion of pipes. This is more likely to happen when the water is slightly acidic. That is why public water treatment systems are now required to carry out pH-adjustments in water that will serve drinking purposes.