Tin - Sn

Chemical properties of tin - Health effects of tin - Environmental effects of tin

Atomic number	50
Atomic mass	118.69 g.mol^{-1}
Electronegativity according to Pauling	1.8
Density	5.77g.cm^{-3} (alpha) and 7.3 g.cm^{-3} at 20°C (beta)
Melting point	232 °C
Boiling point	2270 °C
Vanderwaals radius	0.162 nm
Ionic radius	0.112 nm (+2) ; 0.070 nm (+4)
Isotopes	20
Electronic shell	[Kr] 4d^{10} 5s^{2}5p^{2}
Energy of first ionisation	708.4 kJ.mol^{-1}
Energy of second ionisation	1411.4 kJ.mol^{-1}
Energy of third ionisation	2942.2 kJ.mol^{-1}
Energy of fourth ionisation	3929.3 kJ.mol^{-1}
Discovered by	The ancients

Tin

Tin is a soft, pliable, silvery-white metal. Tin is not easily oxidized and resists corrosion because it is protected by an oxide film. Tin resists corrosion from distilled sea and soft tap water, and can be attacked by strong acids, alkalis and acid salts.

Applications

Tin is used in for can coating: tin-plated steel containers are widely used for food preservation. Tin alloys are employed in many ways: as solder for joining pipes or electric circuits, pewter, bell metal, babbit metal and dental amalgams. The niobium-tin alloy is used for superconductiong magnets, tin oxide is used for ceramics and in gas sensors (as it absorbs a gas its electrical conmductivity increases and this can be monitored). Tin foil was once a common wrapping material for foods and drugs, now replaced by the use of aluminium foil.

Tin in the environment

Tin oxide is insoluble and the ore strongly resists weathering, so the amount of tin in soils and natural waters is low. The concentration in soils is generally between the range 1-4 ppm but some soils have less that 0.1 ppm while peats can have as much 300 ppm.
There are few tin-containing minerals, but only one is of commercial significance and that is cassiterite. The main mining area to be found in the *tin belt* which goes from China through Thailand, Brima and Malaysia to the islands of Indonesia. Malaysia produces 40% of the world's tin. Other important tin mining area are Bolivia and Brazil. Global production is in excess of 140.000 tonnes per year and workable reserves amount to more 4 million tonnes. Tin concetrates are produces in around 130.000 tonnes per year.

Health effects of tin

Tin is mainly applied in various organic substances. The organic tin bonds are the most dangerous forms of tin for humans. Despite the dangers they are applied in a great number of industries, such as the paint industry and the plastic industry, and in agriculture through pesticides. The number of applications of organic tin substances is still increasing, despite the fact that we know the consequences of tin poisoning.
The effects of organic tin substances can vary. They depend upon the kind of substance that is present and the organism that is exposed to it. Triethyltin is the most dangerous organic tin substance for humans. It has relatively short hydrogen bonds. When hydrogen bonds grow longer a tin substance will be less dangerous to human health. Humans can absorb tin bonds through food and breathing and through the skin.
The uptake of tin bonds can cause acute effects as well as long-term effects.

Acute effects are:
- Eye and skin irritations
- Headaches
- Stomachaches
- Sickness and dizziness
- Severe sweating
- Breathlessness
- Urination problems