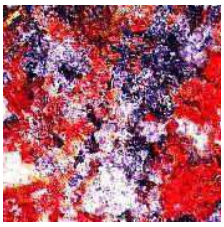
Arsenic - As

Chemical properties of arsenic - Health effects of arsenic - Environmental effects of arsenic

Atomic number	33
Atomic mass	74.9216 g.mol^{-1}
Electronegativity according to Pauling	2.0
Density	5.7 g.cm^{-3} at 14°C
Melting point	814 °C (36 atm)
Boiling point	615 °C (sublimation)
Vanderwaals radius	0.139 nm
Ionic radius	0.222 nm (-2) 0,047 nm (+5) 0,058 (+3)
Isotopes	8
Electronic shell	[Ar] 3d^{10} 4s^{2} 4p^{3}
Energy of first ionisation	947 kJ.mol^{-1}
Energy of second ionisation	1798 kJ.mol^{-1}
Energy of third ionisation	2736 kJ.mol^{-1}
Standard potential	- 0.3 V (As^{3+}/ As)
Discovered by	The ancients



Arsenic

Arsenic appears in three allotropic forms: yellow, black and grey; the stable form is a silver-gray, brittle crystalline solid. It tarnishes rapidly in air, and at high temperatures burns forming a white cloud of arsenic trioxide. Arsenic is a member of group Va of the periodic table, which combines readily with many elements.
The metallic form is brittle, tharnishes and when heated it rapidly oxidizes to arsenic trioxide, which has a garlic odor. The non metallic form is less reactive but will dissolve when heated with strong oxidizing acids and alkalis.

Applications

Arsenic compounds are used in making special types of glass, as a wood preservative and, lately, in the semiconductor gallium arsenade, which has the ability to convert electric current to laser light. Arsine gas AsH_3, has become an important dopant gas in the microchip industry, although it requires strict guidelines regarding its use because it is extremely toxic.
During the 18th, 19th, and 20th centuries, a number of arsenic compounds have been used as medicines; copper acetoarsenite was used as a green pigment known under many different names.

Arsenic in the environment

Arsenic can be found naturally on earth in small concentrations. It occurs in soil and minerals and it may enter air, water and land through wind-blown dust and water run-off. Arsenic in the atmosphere comes from various sources: vulcanoes release about 3000 tonnes per year and microorganisms release volatile methylarsines to the extent of 20.000 tonnes per year, but human activity is responsible for much more: 80.000 tonnes of arsenic per year are released by the burning of fossil fuels.

Despite its notoriety as a deadly poison, arsenic is an essential trace element for some animals, and maybe even for humans, although the necessary intake may be as low as 0.01 mg/day.

Arsenic is a component that is extremely hard to convert to water-soluble or volatile products. The fact that arsenic is naturally a fairly a mobile component, basically means that large concentrations are not likely to appear on one specific site. This is a good thing, but the negative site to it is that arsenic pollution becomes a wider issue because it easily spreads. Arsenic cannot be mobilized easily when it is immobile. Due to human activities, mainly through mining and melting, naturally immobile arsenics have also mobilized and can now be found on many more places than where they existed naturally.

A little uncombined arsenic occurs naturally as microcrystalline masses, found in Siberia, Germany, France, Italy, Romania and in the USA, Most arsenic is found in conjuction with sulfur in minerals such as arsenopyrite (AsFeS), realgar, orpiment and enargite. Non is mined as such because it is produced as a by-product of refining the ores of other metals, such as copper and lead. World production of arsenic, in the form of its oxide, is around 50.000 tonnes per year, far in excess of that required by industry. China is the chief exporting country, followed by Chile and Mexico. World resources of arsenic in copper and lead ores exceed 10 million tonnes.

Health effects of arsenic

Arsenic is one of the most toxic elements that can be found. Despite their toxic effect, inorganic arsenic bonds occur on earth naturally in small amounts. Humans may be exposed to arsenic through food, water and air. Exposure may also occur through skin contact with soil or water that contains arsenic.
Levels of arsenic in food are fairly low, as it is not added due to its toxicity. But levels of arsenic in fish and seafood may be high, because fish absorb arsenic from the water they live in. Luckily this is mainly the fairly harmless organic form of arsenic, but fish that contain significant amounts of inorganic arsenic may be a danger to human health