Osmium - Os

Chemical properties of osmium - Health effects of osmium - Environmental effects of osmium

Atomic number	76
Atomic mass	190.2 g.mol^{-1}
Electronegativity according to Pauling	2.2
Density	22.5 g.cm^{-3} at 20°C
Melting point	3045 °C
Boiling point	5027 °C
Vanderwaals radius	0.136 nm
Ionic radius	0.067 nm (+4)
Isotopes	13
Electronic shell	[Xe] 4f^{14} 5d^{-} 6s^{2}
Energy of first ionisation	838 kJ.mol^{-1}
Standard potential	+ 0.85 V (Os^{2+}/ Os)
Discovered by	Smithson Tennant in 1803

Osmium

Osmium is lustrous, silvery metal, one of the so-called platinum group of metals. It is the densest metal known, althoung only by the narrowest margins. Osmium is uneffected by water and acids, but dissolves with molten alkalis. Osmium powder reacts slowly with the oxygen of the air and gives off detacteble amounts of osmium tetroxide vapour.

Applications

The metal is used in a few alloys and in industry as a catalyst. At one time it was to be encountered in the nibs of high-quality fountain pens, compass needles, long-life gramophone needles and clock bearings, thanks to its extreme hardness and corrosion resistance.

Osmium in the environment

Osmium is mainly found alloyed with other platinum metals, from which it is recovered commercially. The most important ores are either iridosmine and osmiridium. Iridosmine is a rare mineral found in Russia and in North and South America. Less of 100 kg are produced each year. There is little demand for the metal, which is difficult to fabricate.

Health effects of osmium

Osmium tetroxide, OsO_4, is highly toxic. Concentrations in air as low as 10^{-7} g m^{-3} can cause lung congestion, skin damage, and severe eye damage. The oxide, in particular, should only ever be handled by a properly qualified chemist.

Osmium tetroxide can be absorbed into the body by inhalation of its vapour, by inhalation of its aerosol and by ingestion.

Inhalation risk: A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Inhalation: Burning sensation. Cough. Headache. Wheezing. Shortness of breath. Visual disturbances. Symptoms may be delayed. *Skin:* Redness. Skin burns. Pain. Skin discoloration. Blisters. *Eyes:* Redness. Pain. Blurred vision. Loss of vision. Severe deep burns. *Ingestion:* Abdominal cramps. Burning sensation. Shock or collapse.

Chemical dangers: The substance decomposes on heating producing fumes of osmium. The substance is a strong oxidant and reacts with combustible and reducing materials. Reacts with hydrochloric acid to form toxic chlorine gas. Forms unstable compounds with alkalis.

Effects of short-term exposure: Tear drawing. The substance is corrosive to the eyes, the skin, and the respiratory tract. Inhalation of this substance may cause lung oedema. Exposure to high concentrations may result in death. The effects may be delayed.

Effects of long-term or repeated exposure: Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the kidneys.

Environmental effects of osmium

No information found in our select references. However we expect osmium ecotoxicity to be very low because of its strength as an oxidizer, that makes it be readily converted to the dioxide, a form of the metal that is reasonably innocuous.