Gold - Au

Chemical properties of gold - Health effects of gold - Environmental effects of gold

Atomic number	79
Atomic mass	196.9655 g.mol $^{-1}$
Electronegativity ccording to Pauling	2.4
Density	19.3 g.cm^{-3} at 20°C
Melting point	1062 °C
Boiling point	2000 °C
Vanderwaals radius	0.144 nm
Ionic radius	0.137 nm (+1)
Isotopes	7
Electronic shell	[Xe] 4f^{14} 5d^{10} 6s^{1}
Energy of first ionisation	888 kJ.mol $^{-1}$
Energy of second ionisation	1974.6 kJ.mol $^{-1}$
Standard potential	+1,68 V (Au^{+}/ Au)
Discovered	c.a. 3000 BC

Gold

Gold is metallic, with a yellow colour when in a mass, but when finely divided it may be black, ruby, or purple. It is the most malleable and ductile metal; 1 ounce (28 g) of gold can be beaten out to 300 square feet. It is a soft metal and is usually alloyed to give it more strength. It is a good conductor of heat and electricity, and is unaffected by air and most reagents.

Gold is usually alloyed in jewellery to give it more strength, and the term carat describes the amount of gold present (24 carats is pure gold). It is estimated that all the gold in the world, so far refined, could be placed in a single cube 60 ft. on a side.

The most common gold compounds are auric chloride ($AuCl_3$) and chlorauric acid ($HAuCl_4$). A mixture of one part nitric acid with three of hydrochloric acid is called aqua regia (because it dissolved gold, the King of Metals). It is unaffected by air and most reagents.

Applications

Gold is used as buillon and in jewellery, glass and electronics. Jewellery consumes around 75% of all gold produced. Gold for jewellery can be given a range of hues depending on the metal with which is alloyed (white, red, blue, green etc.). Colloidal gold is added to glass to colour it red or purple, and metallic gold is applied as a thin film on the windows of large building to reflect the heat of the Sun's ray. Gold electroplating is used to in the electronic industry to protect their copper components and improve their solderability.

Gold in the environment

Gold is widely distributes on the earth at a background level of 0.03 g/1000 kg (0.03 ppm by weight). Its interness and its high density causes it to concentrate in streambeds, either in small flakes or in larger nuggets, from which it may be recovered by panning. It is found free in nature and associated with quartz, pyrite and other minerals.

Most gold is mined and comes from gravels and quarts veins or is associated with pyrites deposits. Two thirds of the world's supply comes from South Africa, and $^{2}/_{3}$ of USA production is from South Dakota and Nevada. Other main mining areas are Canada and Russia. Gold is found in sea water, but no effective economic process has been designed (yet) to extract it from this source. World production is around 2500 tonnes per year, but reserves are estimated to be ten of thousand of tonnes.

Health effects of gold

Effects of exposure: Inhalation: May cause irritation if exposure is prolonged or excessive. Ingestion: No adverse effects expected. Skin: May cause irritation and allergic reaction. Eye: May cause irritation.

Gold is used to cure rheumatoid arthritis, under a treatment called *Chrysoteraphy.* It is prescribed when treatment with non-steroid antu-infiammatory drugs is failing to give relief.

Environmental effects of gold

Gold has not been evaluated for its ecotoxicity. However, the biodegradation of gold under aerobic conditions is expected to be very poor and there is no evidence to suggest it creates ecological problems when released into the environment. Since gold is insoluble, it is believed to have minimal bioaccumulation and bioavailability characteristics.