

Beryllium - Be

Chemical properties of beryllium - Health effects of beryllium - Environmental effects of beryllium

Atomic number	4
Atomic mass	9.01218 g.mol ⁻¹
Electronegativity according to Pauling	1.5
Density	1.86 g.cm ⁻³
Melting point	1280 °C
Boiling point	2970 °C
Vanderwaals radius	unknown
Ionic radius	unknown
Isotopes	1
Electronic shell	1s ² 2s ² or [He] 2s ²
Energy of first ionisation	899.2 kJ.mol ⁻¹
Energy of second ionisation	1757 kJ.mol ⁻¹
Standard potential	- 1.70 V
Discovered by	Abbé René-Just Hauy in 1798



Beryllium

Beryllium is a toxic bivalent element, steel gray, strong, light-weight, primarily used as hardening agent in alloys. Beryllium has one of the highest melting points of the light metals. It has excellent thermal conductivity, is nonmagnetic, it resists attack by concentrated nitric acid and at standard temperature and pressures beryllium resist oxidation when exposts to air.

Applications

Beryllium is used as an alloying agent in the production of beryllium-copper. Thanks to their electrical and thermal conductivity, high strenght and hardness, non magnetic properties, good resistance, dimensional stability over a wide temperature range beryllium-copper alloys are used in many applications. A typical application of beryllium-copper alloys is in the defense and aerospace industries.

Beryllium is also used in the field of X-ray detection diagnostic (it is transparent to X-rays) and in the making of various computer equipment.

Beryllium in the environment

The beryllium content on Earth crust is 2.6 ppm, in soil 6 ppm. Beryllium in soil can pass into the plants grown on it, provided it in a soluble form. Typical levels in plants vary between 1 and 40 ppb, too low to affect animals which eat these plants.

Beryllium is found in 30 different minerals, the most important of which are bertrandite, beryl, chrysoberyl, and phenacite. Precious forms of beryl are aquamarine and emerald.

Health effects of beryllium

Beryllium is not an element that is crucial for humans; in fact it is one of the most toxic chemicals we know. It is a metal that can be very harmful when humans breathe it in, because it can damage the lungs and cause pneumonia.

The most commonly known effect of beryllium is called berylliosis, a dangerous and persistent lung disorder that can also damage other organs, such as the heart. In about 20% of all cases people die of this disease. Breathing in beryllium in the workplace is what causes berylliosis. People that have weakened immune systems are most susceptible to this disease.

Beryllium can also cause allergic reactions with people that are hypersensitive to this chemical. These reactions can be very heavy and they can even cause a person to be seriously ill, a condition known as Chronic Beryllium Disease (CBD). The symptoms are weakness, tiredness and breathing problems. Some people that suffer from CBD will develop anorexia and blueness of hands and feet. Sometimes people can even be in such a serious condition that CBD can cause their death.

Next to causing berylliosis and CBD, beryllium can also increase the chances of cancer development and DNA damage.

Environmental effects of beryllium

Beryllium enters the air, water and soil as a result of natural processes and human activities. It occurs naturally in the environment in small amounts. Humans add beryllium through production of metal and combustion of coal and oil.

Beryllium exists in air as very small dust particles. It enters waterways during weathering of soils and rocks. Industrial emissions will add beryllium to air and wastewater disposals will add beryllium to water. It usually settles in sediment. Beryllium as a chemical element occurs naturally in soils in small amounts, but human activities have also increased these beryllium levels. Beryllium is not likely to move deeper into the soil and dissolve within groundwater.