

Rhodium - Rh

Chemical properties of rhodium - Health effects of rhodium - Environmental effects of rhodium

Atomic number	45
Atomic mass	102.91 g.mol ⁻¹
Electronegativity according to Pauling	2.2
Density	12.4 g.cm ⁻³ at 20°C
Melting point	1970 °C
Boiling point	3727 °C
Isotopes	9
Electronic shell	[Kr] 4d ⁸ 5s ¹
Energy of first ionisation	742 kJ.mol ⁻¹
Standard Potential	0.6 V
Discovered by	William Wollaston in 1803



Rhodium

Rhodium, together with ruthenium, palladium, osmium, iridium, and platinum form a group of elements referred to as the platinum group metals (PGM).

Rhodium metal is lustrous and silvery white. Rhodium has a higher melting point and lower density than platinum. It has a high reflectance and is hard and durable. Upon heating it turns to the oxide when red and at higher temperatures turns back to the element. Rhodium it is unaffected by air and water up to 600 C. It is insoluble in most acids, including aqua regia, but is dissolved in hot concentrated sulfuric acid and it is attacked by molten alkalis.

Applications

Most metal (85%) goes into catalytic converters for cars. The major use of the metal is in alloys with platinum and iridium, giving improved high-temperature strength and oxidation resistance. These alloys are used in furnace windings, pen nibs, phonograph needles, high-temperature thermocouple and resistance wires, electrodes for aircraft spark plugs, bearings and electrical contacts.

The metal itself, is used to plate jewelry and the reflectors of searchlights, due to its brilliance and resistance to tarnish, It is also a highly useful catalyst in a number of industrial processes, such as the BP-Monsanto process.

Rhodium in the environment

Rhodium occurs as rare deposits of the uncombined metal, for example in Montana, USA and in rare minerals. The metal, which is available commercially, comes as a by product of the refining of certain copper and nickel ores which can contain up to 0.1% rhodium. Most rhodium comes from South Africa and Russia, and world production is around 16 tonnes per year. Estimated reserves are 3.000 tonnes.

Health effects of rhodium

Rhodium compounds are encountered relatively rarely by most people. There are almost no reported cases of human being affected by this element in any way. All rhodium compounds should be regarded as highly toxic and as carcinogenic. Compounds of rhodium stain the skin very strongly.

Flammable. Dust explosion possible if in powder or granular form, mixed with air. Reacts with oxygen difluoride causing fire hazard.

Routes of exposure: The substance can be absorbed into the body by inhalation of its aerosol.

Inhalation risk: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Health effects of exposure to the substance have not been investigated. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Environmental effects of rhodium

Do not allow material to be released to the environment without proper governmental permits. Rhodium is too rare for the amount of it in soils or natural waters to be assessed, and so its effect on the environment can be assumed to be nil. Test on plants have shown that it is the least toxic member of the platinum group of metals.