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## Palladium

### History:

Palladium was discovered by William Hyde Wollaston in 1803. This element was named by Wollaston in 1804 after the asteroid Pallas, which had been discovered two years earlier. Wollaston found palladium in crude platinum ore from South America by dissolving the ore in aqua regia, neutralizing the solution with sodium hydroxide, and precipitating platinum as ammonium chloroplatinate with ammonium chloride. He added mercuric cyanide to form the compound palladium cyanide, which was heated to extract palladium metal.

World demand for palladium increased from 100 tons in 1990 to nearly 300 tons in 2000. The global production of palladium from mines was 222 metric tons in 2006 according to USGS data. Most palladium is used for catalytic converters in the automobile industry.

### Properties:

Palladium is considered to be a precious metal. It is a soft, ductile, steel-white, tarnish-resistant, metallic element occurring naturally with platinum, especially in gold, nickel, and copper ores. Because it can absorb large amounts of hydrogen, it is used as a purification filter for hydrogen and a catalyst in hydrogenation. It is alloyed for use in electric contacts, jewelry, nonmagnetic watch parts, and surgical instruments.

Atomic number 46; atomic weight 106.4; melting point 1,552°C; boiling point 3,140°C; specific gravity 12.02 (20°C); valence 2, 3, 4. An element commonly used in jewelry, electronics, and the purification of hydrogen.

Palladium is used also in dental alloys. Because

hydrogen passes rapidly through the metal at high temperatures, heated palladium tubes impervious to other gases function as semipermeable membranes and are used for hydrogen purification.

It is strongly resistant to corrosion in air and to the action of acids (except nitric acid) at ordinary temperatures. However, it is attacked by hot acids, and it dissolves in aqua regia. It forms many compounds, including oxides, chlorides, fluorides, sulfides, phosphides, and several complex salts. Palladium has a great ability to absorb hydrogen; when finely divided, one volume of palladium absorbs as many as 900 volumes of the gas. When heated, it allows hydrogen to diffuse rapidly through it; it is thus used to purify hydrogen gas.

Palladium is found in nature with platinum minerals & in association with the nickel ores mined near Sudbury, Ont., Canada. Because of its corrosion resistance, a major use of palladium is in alloys used in low voltage electrical contacts. Palladium is used extensively in jewelry-making in certain alloys called "white gold." It may be alloyed with platinum or substituted for it. It is used in watch bearings, springs, and balance wheels and also for mirrors in scientific instruments. For use in Palladium, along with platinum, rhodium, ruthenium, iridium & osmium form a group of elements referred to as the platinum group metals (PGMs). Platinum group metals share similar chemical properties, but palladium has the lowest melting point and is the least dense of these precious metals.

When palladium is at room temperature and atmospheric pressure, it can absorb up to 900 times its own volume of hydrogen, which makes palladium an efficient and safe storage medium for hydrogen and hydrogen isotopes. Palladium is also tarnish resistant, electrically stable and resistant to