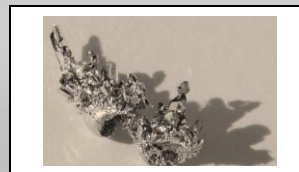


# Palladium

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## **Discovery and origin:**

William Hyde Wollaston noted the discovery of a new noble metal in July 1802 in his lab book and named it palladium. He purified a quantity of the material and offered it, without naming the discoverer, in a small shop in Soho in April 1803. He found it 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 (II) cyanide, which was heated to extract palladium metal.

**Properties:** Palladium is a transition metal with the symbol Pd and atomic number 46. It has an atomic mass of 106.42u.

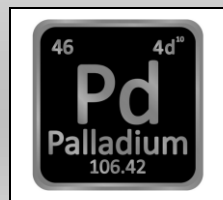
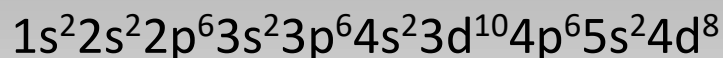
1. **Physical properties:** It is a soft silver-white metal that resembles platinum. It is the least dense and

has the lowest melting point of the platinum group metals. It is soft and ductile when annealed and is greatly increased in strength and hardness when cold-worked.

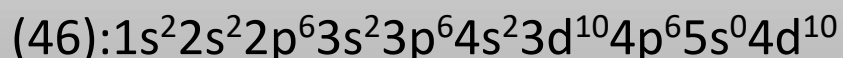
Density	11.9 g.cm <sup>-3</sup> at 20°C
Melting point	1560 °C
Boiling point	2927 °C

2. Chemical properties: Palladium, platinum, rhodium, ruthenium, iridium and osmium form a group of elements referred to as the platinum group metals (PGM's) in which palladium has the lowest melting point and is the least dense of them. It is a good catalyst and is used for hydrogenation and dehydrogenation reactions. It belongs to group 10 in the periodic table, but the configuration in the outermost electrons is in accordance with Hund's rule. Electrons in the s orbital migrate to fill the d orbitals because at higher energy levels, the levels are said to be degenerated. Thus there is a change in electronic configuration. It does not react with oxygen at standard temperature and does not tarnish in air.

Expected configuration, Pd (46):



Actual configuration, Pd



**Uses of Palladium:** Palladium is a metal that resists corrosion. It is also used in jewellery and some dental fillings and crowns. The chief use of palladium, however, is in automobile catalytic converters (often in combination with rhodium). The palladium serves as a catalyst to convert polluting hydrocarbons, carbon monoxide, and nitrogen oxide in the exhaust to water, carbon dioxide, and nitrogen.

## **Isotopes of palladium**

Isotopes With A Known Natural Abundance		
Mass Number	Natural Abundance	Half-life
102	1.02%	STABLE
104	11.14%	STABLE
105	22.33%	STABLE
106	27.33%	STABLE
108	26.46%	STABLE
110	11.72%	STABLE

## **Fun facts about palladium:**

1. Palladium has the ability to absorb up to 900 times its own volume in hydrogen, making it the perfect container to not only store hydrogen but to also filter it.
2. It is a biologically inactive element, allowing for it to be yet another metal perfect for jewelry due to its relatively low probability to cause an allergic reaction.
3. Russia and South Africa supply about 40% of the world's palladium, making them the highest producers each year.
4. Palladium is naturally found alloyed with gold and other platinum grouped metals (PGMs).
5. Jewelers began using palladium in 1939 as a platinum alternative when creating white gold.