



# RHODIUM

Rh

45

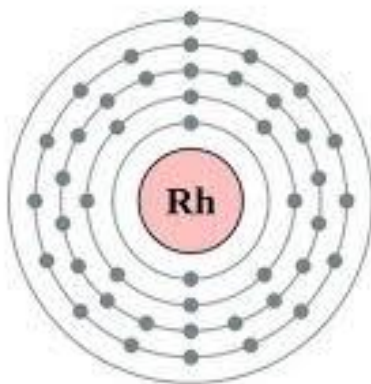
102.91



Rhodium

45  
**Rh**

Rhodium  
102.90550



45

**Rh**

Rhodium  
102.90550

# Discovery and naming

- In the early 1800s, Wollaston was studying an ore of platinum. Although scientists don't know for sure, they believe the platinum ore came from South America. Wollaston analyzed the ore and found that he could produce a beautiful rose-colored compound from it. He showed that the pink compound contained a new element. Wollaston suggested the name rhodium for the new element because of this rose color. The Greek word for rose is *rhodon*.

# Physical properties

- Rhodium is a silver-white metal. It has a melting point of  $1,966^{\circ}\text{C}$  ( $3,571^{\circ}\text{F}$ ) and a boiling point of about  $4,500^{\circ}\text{C}$  ( $8,100^{\circ}\text{F}$ ). Its density is 12.41 grams per cubic centimeter. Two of the metal's special properties are its high electrical and heat conductivity. That means that heat and electricity pass through rhodium very easily.

# Chemical properties

- Rhodium is a relatively inactive metal. It is not attacked by strong acids. When heated in air, it combines slowly with **oxygen**. It also reacts with chlorine or bromine when very hot. It does not react with **fluorine**, an element that reacts with nearly every other element.

# Occurrence in nature

- Rhodium is one of the rarest elements on Earth. Its abundance is estimated to be 0.0001 parts per million. That would place it close to the bottom of the list of elements in terms of abundance. Compounds of rhodium are usually found in combination with platinum and other members of the platinum group. Its most common ores are rhodite, sperrylite, and iridosmine.
- The first rhodium compound was a beautiful rose color

# Isotopes

- Only one naturally occurring isotope of rhodium is known, rhodium-103.
- Rhodium also has a number of radioactive isotopes

# Extraction

- Rhodium is usually obtained as a by-product in the recovery of platinum from its ores. Rhodium is separated by a series of chemical and physical reactions from other platinum metals with which it occurs. The mixture of metals is treated with various acids and other chemicals that dissolve some metals, but not others. Rhenium is one of the first metals to be removed from such a mixture.
- The cost of pure rhodium was \$25 per gram (\$600 per troy ounce) in 1997. It cost approximately ten times that in 1991.



# Uses

- Most of the rhodium metal sold in the United States is used to make alloys. An alloy is made by melting and mixing two or more metals. The mixture has properties different from those of the individual metals. Rhodium is often added to platinum to make an alloy. Rhodium is harder than platinum and has a higher melting point. So the alloy is a better material than pure platinum.
- Most rhodium alloys are used for industrial or research purposes, such as laboratory equipment and thermocouples. A thermocouple is a device for measuring very high temperatures. Rhodium alloys are also used to coat mirrors and in search-lights because they reflect light very well.



Rhodium-plated white gold wedding ring



Rhodium foil and wire



A 78 g sample of rhodium



Cross section of a metal-core catalytic converter

# Compounds

- Compounds of rhodium are used as catalysts. A catalyst is a substance used to speed up or slow down a chemical reaction without undergoing any change itself.

## ● **Fluorides**

Rhodium trifluoride:  $\text{RhF}_3$

Rhodium hexafluoride:  $\text{RhF}_6$

Rhodium tetrafluoride:  $\text{RhF}_4$

Tetrarhodium eicosafluoride:  $[\text{RhF}_5]_4$

## ● **Chlorides**

Rhodium trichloride:  $\text{RhCl}_3$

## ● **Bromides**

Rhodium tribromide:  $\text{RhBr}_3$

## ● **Iodides**

Rhodium triiodide:  $\text{RhI}_3$

- Sulfides

Rhodium disulphide:  $\text{RhS}_2$

Dirhodium trisulphide:  $\text{Rh}_2\text{S}_3$

- Selenides

Rhodium diselenide:  $\text{RhSe}_2$

- Tellurides

Rhodium ditelluride:  $\text{RhTe}_2$

- Carbonyls

Dirhodium octacarbonyl:  $\text{Rh}_2(\text{CO})_8$

Tettrarhodium dodecacarbonyl:  $\text{Rh}_4(\text{CO})_{12}$

Hexarhodium hexadecacarbonyl:  $\text{Rh}_6(\text{CO})_{16}$

- Complexes

Tripotassium hexachlororhodate:  $\text{K}_3[\text{RhCl}_6]$

Pentaamminechlororhodium dichloride:  $[\text{RhCl}(\text{NH}_3)_5]\text{Cl}_2$

Dirhodium tetracarbonyl dichloride:  $\text{Rh}_2(\text{CO})_4\text{Cl}_2$

# Health effects

- There are no studies of the health effects from rhodium or its common compounds. Elements without information about toxicity are usually treated as if they are poisonous.



**THANKS FOR YOUR  
ATTENTION!!!**