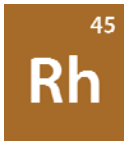
Stable Isotopes of Rhodium

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Nuclear Spin
Rh-103	45	58	102.905504	100.00%	1/2-



Rhodium was discovered in 1803 by William Hyde Wollaston. Its name originates with the Greek word *rhodon,* meaning “rose.” Rhodium occurs in nature in trace quantities, always associated with other platinum metals.

A grayish-white metal with face-centered cubic crystals, rhodium is harder and has a higher melting point than platinum or palladium; it also has the highest electrical and thermal conductivity of the platinum group. It is insoluble in water and soluble in concentrated sulfuric or hydrochloric acids under boiling conditions. The metal in massive form is slightly soluble in *aqua regia,* but in small quantities or in thin plates it partially dissolves in *aqua regia.* It forms solid solutions with platinum, palladium and iridium.

Rhodium is stable in air at ordinary temperatures. When heated above 600 ºC, it oxidizes and forms a dark oxide coating on its surface. The gray crystalline sesquioxide has a corundum-like crystal structure. The sesquioxide decomposes back to its elements when heated above 1100 ºC. However, on further heating, the metal starts to lose its weight, similar to the behavior of platinum. Molten rhodium metal readily absorbs gaseous oxygen. The metal in powder form absorbs hydrogen when heated. The metal combines with halogens at elevated temperatures. When heated with fluorine to 500-600 ºC, it forms a trifluoride: a red rhombohedral crystalline powder insoluble in water, dilute acids or alkalis. Rhodium is attacked by fused caustic soda, caustic potash, fused sodium, potassium cyanide and sodium bisulfate.

Some important applications of this metal or its compounds include making glass for mirrors or filtering light, catalytic reactions for synthesizing a number of products, as an alloying element for platinum, as a hardening agent for platinum and palladium at high temperatures, and in electrical contact plates in radio- and audio-frequency circuits. Rhodium alloys also are used in laboratory crucibles, electrodes, optical instruments, furnace linings and glass fibers.

Properties of Rhodium

Name	Rhodium
Symbol	Rh
Atomic number	45
Atomic weight	102.906
Standard state	Solid at 298 °K
CAS Registry ID	7440-16-6

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Properties of Rhodium (continued)

Group in periodic table	9
Group name	Precious metal or platinum group metal
Period in periodic table	5
Block in periodic table	d-block
Color	Silvery white metallic
Classification	Metallic
Melting point	1964 °C
Boiling point	3727 °C
Vaporization point	3695 °C
Thermal conductivity	150.00 W/(m·K) at 298.2 °K
Electrical resistivity	4.51 μΩ·cm at 20 °C
Electronegativity	2.2
Specific heat	0.24 kJ/kg K
Heat of vaporization	495.00 $kJ \cdot mol^{-1}$
Heat of fusion	21.70 $kJ \cdot mol^{-1}$
Density of liquid	10.70 g/cm^3 at 1964 °C
Density of solid	12.45 g/cm^3
Electron configuration	$[Kr]4d^8 5s^1$
Atomic radius	1.34 Å
Ionic radius	Rh^{3+}: 0.67 Å (coordination number 6)
Oxidation states	+2, +3, +4, +5, +6
Most stable oxidation state	+3

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