

Stable Isotopes of Yttrium

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Nuclear Spin
Y-89	39	50	88.905849	100.00%	1/2-



Yttrium was discovered in 1794 by Johann Gadolin. It is named after Ytterby, a village near Vaxholm in Sweden.

A grayish, lustrous metal, yttrium is known only in its tri-positive state. It has a hexagonal close-packed crystal structure that converts to a body-centered cubic structure at 1490 °C. It is soluble in dilute acids and potassium hydroxide solution, and it decomposes in water.

The chemical properties of yttrium are more similar to those of rare earths than to those of scandium. Yttrium combines with oxygen, forming its only oxide, Y_2O_3 , the reaction of which is much faster at high temperatures, particularly above 400 °C. The metal, in the form of sponge or small particles, can ignite at this temperature. At ambient temperatures, the metal is slightly tarnished by oxygen or air, forming a very thin film of oxide that protects the metal from further oxidation. The metal reacts with halogens above 200 °C, forming its trihalides. It combines with nitrogen above 1000 °C, producing a nitride, YN. It combines at elevated temperatures, forming binary compounds with most nonmetals and some metalloid elements, such as hydrogen, sulfur, carbon, phosphorus, silicon and selenium.

Yttrium alloys have many applications. The metal, doped with rare earths such as europium, is used as a phosphor for color-television receivers. When added to iron, chromium, vanadium, niobium or other metals, it enhances the resistance of these metals and their alloys to high-temperature oxidation and recrystallization. It is a deoxidizer for vanadium and other nonferrous metals. Yttrium-aluminum garnets are used in lasers and in jewelry gemstones. Yttrium-iron garnets are used as transmitters and as transducers of acoustic energy.

Properties of Yttrium

Name	Yttrium
Symbol	Y
Atomic number	39
Atomic weight	88.906
Standard state	Solid at 298 °K
CAS Registry ID	7440-65-5
Group in periodic table	3
Group name	None

Properties of Yttrium (continued)

Period in periodic table	5
Block in periodic table	d-block
Color	Silvery white
Classification	Metallic
Melting point	1526 °C
Boiling point	3338 °C
Vaporization point	3336 °C
Thermal conductivity	17.20 W/(m·K) at 298.2 °K
Electrical resistivity	59.60 $\mu\Omega\cdot\text{cm}$ at 25 °C
Electronegativity	1.3
Specific heat	0.30 kJ/kg K
Heat of vaporization	380.00 kJ·mol ⁻¹
Heat of fusion	11.40 kJ·mol ⁻¹
Density of liquid	4.24 g/cm ³ at 1526 °C
Density of solid	4.47 g/cm ³
Electron configuration	[Kr]4d ¹ 5s ²
Atomic radius	1.80 Å
Oxidation state	+3