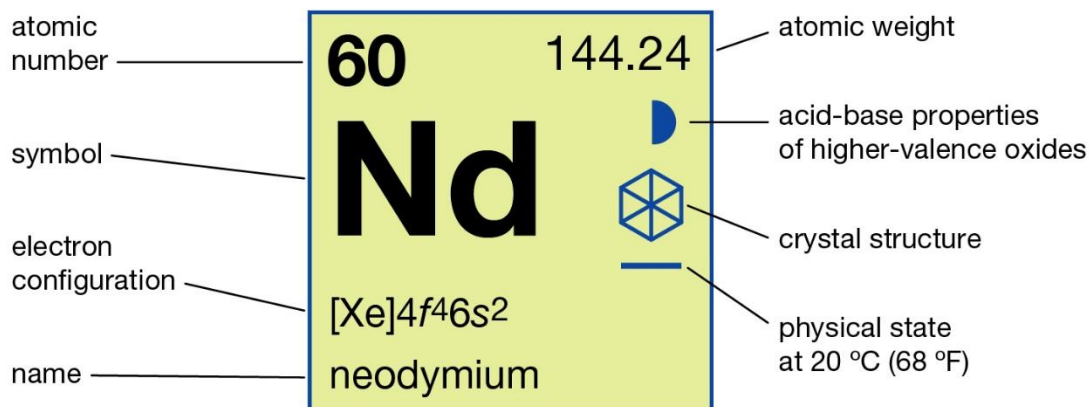




Prateek Gupta.

Neodymium.

Neodymium



	Rare-earth elements and lanthanoid elements		Solid
	Hexagonal		Weakly basic

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The name neodymium is derived from the Greek words neos “new”, and didymos “twin”.

Physical Properties: It is a hard, slightly malleable silvery metal that quickly tarnishes in air and moisture. When oxidized, neodymium reacts quickly to produce pink, purple/blue and yellow compounds in the +2, +3 and +4 oxidation states.

Uses Important use of neodymium is as a component in the alloys used to make high-strength neodymium magnets. These magnets are widely used in such products as microphones, professional loudspeakers, in-ear headphones, high performance hobby DC electric motors, and computer hard disks, where low magnet mass (or volume) or strong magnetic fields are required.

History:

Neodymium was discovered by Austrian chemist Carl Auer von Welsbach in Vienna in 1885. He separated neodymium, as well as the element praseodymium, from their mixture, called didymium, by means of fractional crystallization of the double ammonium nitrate tetrahydrates from nitric acid. Von Welsbach confirmed the separation by spectroscopic analysis, but the products were of relatively low purity. Didymium was discovered by Carl Gustaf Mosander in 1841, and pure neodymium was isolated from it in 1925

Neodymium compounds were first commercially used as glass dyes in 1927, and they remain a popular additive in glasses. The color of neodymium compounds is due to the Nd^{3+} ion and is often a reddish-purple, but it changes with the type of lighting, because of the interaction of the sharp light absorption bands of neodymium with ambient light enriched with the sharp visible emission bands of mercury, trivalent europium or terbium. Some neodymium-doped glasses are used in lasers that emit infrared with wavelengths between 1047 and 1062 nanometers. These have been used in extremely-high-power applications, such as experiments in inertial confinement fusion. Neodymium is also used with various other substrate crystals, such as yttrium aluminium garnet in the Nd:YAG laser.

Neodymium compounds includes:

- halides: neodymium(III) fluoride (NdF_3); neodymium(III) chloride (NdCl_3); neodymium(III) bromide (NdBr_3); neodymium(III) iodide (NdI_3)
- oxides: neodymium(III) oxide (Nd_2O_3)
- sulfides: neodymium(II) sulfide (NdS), neodymium(III) sulfide (Nd_2S_3)
- nitrides: neodymium(III) nitride (NdN)
- hydroxide: neodymium(III) hydroxide ($\text{Nd}(\text{OH})_3$)
- phosphide: neodymium phosphide (NdP)
- carbide: neodymium carbide (NdC_2)
- nitrate: neodymium(III) nitrate ($\text{Nd}(\text{NO}_3)_3$)
- sulfate: neodymium(III) sulfate ($\text{Nd}_2(\text{SO}_4)_3$)



$(\text{Nd}_2(\text{SO}_4)_3)$

Some neodymium compounds have colours that vary based upon the type of lighting.



A.

B.

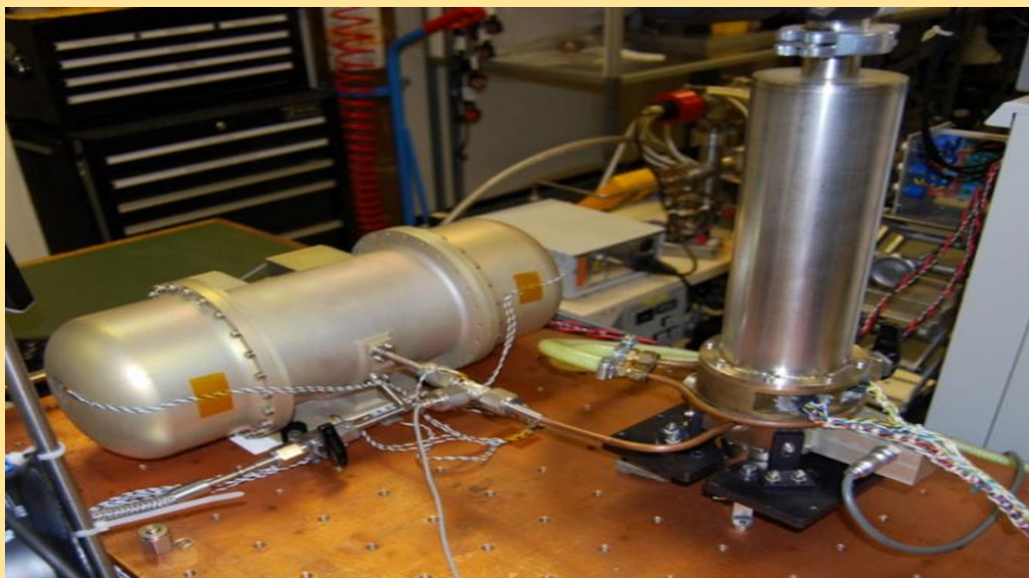
C.

(Left to right, the sulphate, nitrate, and chloride)

- A. Neodymium compounds in florescent light.
- B. Neodymium compounds in compact florescent lamp light.
- C. Neodymium compounds in normal daylight.

Applications:

- Neodymium has an unusually large specific heat capacity at liquid-helium temperatures, so is useful in cryocoolers.



- [Samarium–neodymium dating](#) is useful for determining the age relationships of rocks and meteorites.
- Neodymium isotopes recorded in marine sediments are used to reconstruct changes in past ocean circulation.¹

[Neodymium magnets](#) (actually an alloy, $\text{Nd}_2\text{Fe}_{14}\text{B}$) are the strongest [permanent magnets](#) known. A neodymium magnet of a few grams can lift a thousand times its own weight.



Neodymium magnets appear in products such as microphones, professional loudspeakers, in-ear headphones, guitar and bass guitar pick-ups, and computer hard disks where low mass, small volume, or strong magnetic fields are required. Neodymium is used in the electric motors of hybrid and electric automobiles and in the electricity generators of some designs of commercial wind turbines (only wind turbines with "permanent magnet" generators use neodymium). For example, drive electric motors of each Toyota Prius require one kilogram (2.2 pounds) of neodymium per vehicle.

-Certain transparent materials with a small concentration of neodymium ions can be used in lasers as [gain media](#) for infrared wavelengths (1054–1064 nm), generate high-powered infrared laser beams which are converted to green laser light in commercial [DPSS](#) hand-held lasers and [laser pointers](#).

Neodymium glass solid-state lasers are used in extremely high power (terawatt scale), high energy (megajoules) multiple beam systems for inertial confinement fusion. Nd:glass lasers are usually frequency tripled to the third harmonic at 351 nm in laser fusion devices. Neodymium doped glass slabs used in extremely powerful lasers for [inertial confinement fusion](#).

