

Praseodymium (Pr) - Student Datasheet

Element 59 · Lanthanide · source-reviewed learning reference

Praseodymium is element 59, a lanthanide whose $4f^3$ configuration and Pr^{3+}/Pr^{4+} chemistry connect the periodic table to permanent magnets, specialty alloys, colored glass and optical filters.

Quick reference

Atomic number	59
Relative atomic mass	140.908
Electron configuration	[Xe] $4f^3 6s^2$
Period / group / block	6 / Lanthanide / f
State context	Soft silvery lanthanide metal
Density	6.77 g/cm ³
Melting / transition	1204 K
Boiling / gas reference	3793 K
Oxidation states	+3, +4
Electronegativity	1.13

Structure & orbitals

Ordinary praseodymium is represented with a DHCP teaching cell. Temperature-dependent solid allotropy exists; the phase track keeps the model conservative rather than extending one structure beyond its evidence.

The displayed $4f_{xyz}$ orbital is one representative real f cubic harmonic. It is not a picture of the whole 4f subshell or the electronic bands in the bulk material.

Phase behavior

At approximately standard pressure, praseodymium is treated as a solid below 1204 K, liquid between melting and approximately 3793 K, and gas above the boiling reference. The ordinary crystal label applies to the stated material reference; unmodeled solid allotropy is not fabricated.

Five things to remember

- Atomic number 59 means every praseodymium nucleus has 59 protons.
- Neutral Praseodymium has the ground-state configuration [Xe] $4f^3 6s^2$.
- The representative teaching isotope is ^{141}Pr .
- Praseodymium metal is not the same material as praseodymium oxide, Pr-containing glass or a rare-earth magnet.
- The ordinary material reference is Double hexagonal close-packed (DHCP) reference.

Praseodymium: Real World & Signature Science

Element-specific science, uses and history

Big idea

Praseodymium metal is not the same material as praseodymium oxide, Pr-containing glass or a rare-earth magnet. The green/yellow colors associated with Pr usually come from ions in compounds or host materials, not from the silvery metal itself.

Why this element is scientifically distinctive

Explore Pr across the teaching nucleus, isolated-atom orbitals, evidence-aware material structure and temperature/evidence views, then connect those models to uses, isotopes, search-led questions and source-backed context.

Permanent magnets	Pr can partly substitute or accompany Nd in high-performance rare-earth magnet materials.
Aircraft alloys	Praseodymium-containing magnesium alloys have specialized high-temperature/lightweight applications.
Glass & ceramics	Pr compounds can color glasses, enamels and ceramics yellow-green.
Didymium filters	Pr/Nd-containing glass can filter intense yellow emission in glassworking and related optical uses.
Compound boundary	The vivid colors of Pr salts and oxides come from ionic electronic transitions; elemental Pr metal is silvery.

From source material to Praseodymium applications: high-level material path

1. Praseodymium is obtained from mineral or metallurgical feedstocks in which it is chemically associated with other elements rather than mined as abundant native metal.
2. Industrial separation and refining produce element-specific compounds or metal feedstock; this guide does not provide operational extraction recipes.
3. The refined material is converted into the particular alloy, compound, doped host or component required by the application.
4. Recycling and recovery depend on the host product, concentration and economics; application materials must not be confused with pure element.

History checkpoints

1885	Carl Auer von Welsbach separated “didymium” into praseodymium and neodymium.
Late 19th century	Spectroscopy and improved rare-earth separations established praseodymium as a distinct element.
20th century	Pr compounds became useful in glass, ceramics, alloys and optical materials.
Today	Pr is important in selected magnet and advanced-material supply chains.

Use contexts

- ['Magnets', 'Pr is used with Nd and other elements in some high-performance permanent-magnet compositions.']
- ['Alloys', 'Pr-containing alloys can support specialized high-temperature and lightweight applications.']
- ['Optical glass', 'Pr ions provide characteristic absorption/color in glasses and filters.']
- ['Ceramics & pigments', 'Pr compounds provide durable colors in selected ceramic and enamel systems.']

Praseodymium: Isotopes, Questions & Evidence

Evidence status and learner self-check

Isotope context

^{141}Pr	Natural isotope	Essentially all natural praseodymium is ^{141}Pr .
Radioisotopes	Artificial isotopes	Used mainly in research contexts.
Natural praseodymium	Single-isotope natural element	Relative atomic mass is therefore close to the ^{141}Pr isotopic mass.

Common questions

What is praseodymium?

Praseodymium is chemical element 59, symbol Pr, a soft silvery lanthanide metal.

What is praseodymium used for?

It is used in rare-earth magnets, specialty alloys, colored glass, ceramics and optical filters.

Where is praseodymium found?

It occurs mixed with other lanthanides in minerals such as monazite and bastnäsite and is separated during rare-earth processing.

Who discovered praseodymium?

Carl Auer von Welsbach separated praseodymium from didymium in 1885.

Is praseodymium a metal?

Yes. It is a lanthanide metal, not a nonmetal or metalloid.

How did praseodymium get its name?

The name comes from Greek words associated with "green" and "twin," reflecting the green salts and its origin from didymium.

Evidence & safety

Atomic identity and reference values are source-reviewed. Material viewers are teaching representations, not crystallographic refinements. Search demand shapes headings and FAQs but never overrides measured/evaluated evidence or element-versus-compound distinctions.

This page is educational. Chemical, occupational, radiological or medical safety decisions require the specific material/isotope, its current safety data and qualified guidance.

Core sources

Royal Society of Chemistry - Praseodymium - <https://periodic-table.rsc.org/element/59/praseodymium>

NIST - Atomic Weights and Isotopic Compositions - https://physics.nist.gov/cgi-bin/Compositions/stand_alone.pl

IUPAC - Periodic Table of Elements - <https://iupac.org/what-we-do/periodic-table-of-elements/>