

Polonium (Po) - Student Datasheet

Atomic number 84 - Radioactive chalcogen - Group 16 - Period 6 - p-block

Polonium is element 84, a rare radioactive chalcogen famous for two very different reasons: Marie Curie named it for Poland, and alpha-polonium is the textbook elemental example of a simple-cubic crystal. Its isotope science also demonstrates how nuclear decay can generate heat in matter.

Quick reference

Atomic number	84
Relative atomic mass	[209]
Electron configuration	[Xe] 4f14 5d10 6s2 6p4
State at 20 C	Radioactive solid at 20 deg C
Density	9.20 g/cm3
Melting point	527 K
Boiling point	1235 K
Common oxidation state	+2 and +4 common - +6 also reported
Electronegativity	2.0

Structure & orbitals

alpha-Po is the classic simple-cubic elemental crystal. On heating, beta-Po is rhombohedral; the alpha <-> beta transition shows hysteresis, so a single exact reversible threshold would be misleading.

The 6s and 6p clouds are isolated-atom probability models. They do not depict alpha particles or radioactive decay; decay originates in the nucleus.

Temperature / phase context

A teaching path for polonium shows alpha-Po simple-cubic solid at lower temperature, a beta-Po rhombohedral solid region before melting, liquid to the boiling reference, and gas above. The alpha <-> beta transition is hysteretic, so the marker is an approximate heating reference rather than a perfectly reversible equilibrium switch.

Five things to remember

- Atomic number 84 means every polonium nucleus contains 84 protons.
- Polonium has no stable isotopes.
- alpha-polonium is simple cubic, an unusually rare crystal structure among elements.
- On heating, alpha-Po transforms to rhombohedral beta-Po with substantial hysteresis reported for the transition.
- Polonium was discovered by Marie and Pierre Curie and named for Poland.

Polonium: Real World & Signature Science

Polonium's simple-cubic lattice is a materials-science curiosity; its radioactivity is a nuclear property. Neither fact makes polonium suitable for ordinary handling.

Why this element matters

Simple-cubic crystal alpha-Po is a striking crystallography example because atoms occupy a simple-cubic lattice near room temperature.	Self-heating Strong alpha activity, especially for Po-210, can generate significant heat in a sufficiently concentrated source; this is nuclear energy deposition, not ordinary chemical combustion.
Discovery history Marie and Pierre Curie identified polonium in pitchblende research in 1898 and named it for Poland.	Decay-chain occurrence Tiny natural amounts arise in uranium decay chains; polonium is not a bulk natural resource.
Safety boundary Polonium is highly radiotoxic if taken into the body. This page is educational and gives no sourcing, isolation or handling procedures.	

How polonium is studied: evidence and safety, not extraction instructions

1. Natural polonium appears only in trace quantities as members of radioactive decay chains.
2. Polonium isotopes can also be produced in specialized nuclear facilities, but operational production details are intentionally outside this guide.
3. Scientific measurements focus on decay, isotope identity, crystal structure and chemistry using controlled radiological methods.
4. Element Lookup provides no sourcing, separation, concentration or handling procedures for polonium.

Where on Earth?

Discovery - Paris - 1898

Marie and Pierre Curie identified polonium during pitchblende research in Paris

Naming geography - Poland

Marie Curie named polonium for her homeland Poland, then partitioned and absent as an independent state

Natural occurrence - Decay-chain conceptual

Polonium occurs only in tiny transient amounts in radioactive decay chains; mapping 'deposits' would be misleading

History

1898 - Marie and Pierre Curie announced evidence for a new radioactive element in pitchblende residues and named it polonium.

Early 20th century - Radioactivity research established polonium as an intense alpha emitter and clarified its place in decay chains.

20th century - Polonium isotopes were studied for nuclear physics and specialized heat-source applications under strict controls.

Today - Polonium remains primarily a research and radiological-safety subject rather than a commercial bulk material.

Uses

Nuclear research Polonium isotopes are studied as alpha emitters and as part of radioactive decay-chain physics.	Historical antistatic devices Po-210 was used in some historical static eliminators, an application largely replaced by safer technologies.
Specialized heat-source history The heat from alpha decay has been used in specialized historical contexts; this is not a consumer-use recommendation.	Crystallography education alpha-Po is a memorable example of the simple-cubic lattice.

Polonium: Isotopes, Questions & Evidence

Isotopes

²¹⁰Po - Radioactive - half-life about 138 days

A well-known strong alpha emitter and the teaching nucleus used on this page.

²⁰⁹Po - Radioactive - long-lived on human time scales

Often used as the bracketed mass-number reference in periodic-table data for polonium.

Polonium isotope family - No stable isotopes

All polonium isotopes are radioactive; nuclear identity is essential to any property discussion.

Common questions

Is polonium a metal?

Polonium is commonly described as a metallic or metalloid-like heavy chalcogen; its elemental solid has metallic characteristics, but classification language varies across references.

What is polonium's atomic number?

84.

What was polonium named after?

Poland, Marie Curie's homeland.

Where was polonium discovered?

Marie and Pierre Curie discovered it in Paris in 1898 while studying pitchblende.

What crystal structure does alpha-polonium have?

Simple cubic, one of the rarest elemental crystal structures.

What is polonium used for?

Modern use is limited and specialized, mainly scientific; historical applications included antistatic devices and heat-source contexts.

Quick self-check

1. What is polonium's atomic number? Answer: 84
2. What is special about alpha-polonium's crystal structure? Answer: It is simple cubic
3. What was polonium named after? Answer: Poland
4. Does polonium have stable isotopes? Answer: No
5. Why is the alpha <-> beta transition shown with a caveat? Answer: The transition has substantial hysteresis

Safety boundary

Polonium is highly radioactive and radiotoxic. This guide intentionally excludes sourcing, separation, preparation, concentration and handling instructions.

Evidence & provenance

Atomic identity, radioactivity and alpha-Po simple-cubic structure are measured/evaluated. The alpha <-> beta transition is represented with an approximate heating threshold and an explicit hysteresis warning. No operational radiological instructions are provided.

Core sources

Royal Society of Chemistry - Polonium	https://periodic-table.rsc.org/element/84/polonium
NIST - Atomic Data for Polonium	https://physics.nist.gov/PhysRefData/Handbook/Tables/poloniumtable1.htm
AFLOW - Polonium crystal structures	https://aflow.org/
Nobel Prize - Marie Curie biographical/discovery context	https://www.nobelprize.org/prizes/physics/1903/marie-curie/biographical/