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Cf
Californium
[251]

Key Properties

Atomic Mass	[251]
Category	actinide
State at 20°C	solid
Melting Point	900°C
Boiling Point	null
Density	15.1
Electron Config	[Rn] 5f107s2
Electronegativity	1.3
Year Discovered	1950
Discovered By	Stanley Thompson, Kenneth Street, Jr., Albert Ghiorso, and Glenn Seaborg

Did You Know?

- 1 It was named after the state of California and the University of California, Berkeley, where it was discovered.
- 2 Californium-252 is an extremely powerful neutron emitter. One microgram can produce 170 million neutrons per minute.
- 3 This neutron-emitting property makes it useful for starting up nuclear reactors and as a portable neutron source for detecting gold and silver in ores.
- 4 It is also used in a type of radiation therapy for cancer called neutron brachytherapy.
- 5 Californium is the heaviest element that has been produced in weighable amounts.

APPEARANCE

Californium is a silvery-white, radioactive, synthetic metal.

SUPERHERO PERSONA

"The Neutron Star, a hero who emits a torrent of neutrons, starting nuclear reactors and fighting cancer."

EVERYDAY CONNECTION

Californium is found as a neutron source used to start up nuclear reactors.

POP CULTURE

Californium is the most expensive element, valued at around \$27 million per gram.

Overview of Californium

Californium is a synthetic, silvery-white, highly radioactive metal in the actinide series. It is one of the few elements produced in milligram quantities each year, making it extremely rare and costly. Named after the state of California, where it was first synthesized, californium is mainly valued as a strong source of neutrons for research and industrial applications.

Uses of Californium

The primary importance of californium lies in its ability to emit large numbers of neutrons:

Geological exploration: Portable neutron sources made from californium are used to detect gold and silver ores and to locate water and oil layers in wells.

Structural safety: In aviation, californium-based detectors can reveal metal fatigue and stress in aircraft components without dismantling them.

Research applications: Californium is also used in nuclear research to study the properties of other heavy elements.

Natural Occurrence and Production of Californium

Californium does not occur naturally on Earth. It is produced artificially in nuclear reactors by subjecting plutonium-239 or curium-242 to intense neutron bombardment.

The isotope californium-252 is especially useful because it emits a high number of neutrons during decay and has a half-life of about 2.6 years, making it practical for industrial use.

History of Californium

1950 – Discovery: Californium was first synthesized at the University of California, Berkeley, by a team led by Stanley Thompson, Albert Ghiorso, and Glenn Seaborg. They bombarded curium-242 with alpha particles, producing californium-245.

Initial production: The first experiment yielded only about 5,000 atoms of californium-245, which has a half-life of 44 minutes.

Larger samples: It took nearly a decade after discovery before enough californium could be accumulated to be visible to the naked eye.

Biological Role of Californium

Californium has no known biological role. It is intensely radioactive and therefore toxic, requiring strict protective measures when handled.