Lutetium (Lu)

Element 71 — Complete Summary

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71
Lu
Lutetium
174.967

Key Properties

Atomic Mass	174.967
Category	Lanthanides
State at 20°C	solid
Melting Point	1663°C
Boiling Point	3402°C
Density	9.841
Electron Config	[Xe] 4f145d16s2
Electronegativity	1.27
Year Discovered	1907
Discovered By	Georges Urbain & Carl Auer von Welsbach

✨ Did You Know?

1. It is named after Lutetia, the ancient Roman name for the city of Paris.
2. Lutetium is the last element in the lanthanide series and is also the hardest and densest of the lanthanides.
3. The radioactive isotope lutetium-177 is used in targeted radionuclide therapy to treat certain types of cancers, such as neuroendocrine tumors.
4. It is one of the rarest and most expensive of the rare earth elements.
5. It is used as a catalyst in oil refineries to help break down large hydrocarbon molecules in a process called cracking.

APPEARANCE
Lutetium is a silvery-white, hard, and dense metal.

SUPERHERO PERSONA
"The Final Lanthanide, the last and densest of the rare-earth heroes, used in cancer-fighting therapies."

EVERYDAY CONNECTION
Lutetium is found in a detector in Positron Emission Tomography (PET) medical scanners.

POP CULTURE
Lutetium is used as a catalyst for cracking hydrocarbons in oil refineries.

Overview of Lutetium: The Last of the Rare Earths

Lutetium is a silvery-white, hard, and dense metal with atomic number 71. It is the final element in the lanthanide series, completing the group of rare earth elements. Its name comes from Lutetia, the ancient Latin name for Paris, in honor of the city where it was first identified.

Why Is Lutetium Useful?

Lutetium is one of the most expensive rare earth elements, so its uses are limited, but its unique properties make it valuable in certain industries:

Catalysts: Lutetium compounds are used in petroleum refining, where they act as catalysts to “crack” hydrocarbons, breaking crude oil into useful fuels like gasoline.

Research Applications: Lutetium isotopes are studied in nuclear science, and lutetium-based compounds are being researched for their role in cancer treatments and other medical imaging technologies.

Other Uses: Though niche, lutetium can also be used in certain alloys and high-tech optics.

Biological Role of Lutetium

Lutetium has no known biological role in humans or animals. It is considered to have low toxicity compared to many heavy metals.

Natural Abundance and Extraction

Occurrence: Lutetium is never found in its pure form. Instead, it is found in rare earth minerals such as monazite and xenotime, usually alongside other lanthanides.

Extraction: Obtaining lutetium is a complex and costly process, typically involving ion-exchange and solvent-extraction methods, followed by the reduction of lutetium fluoride with calcium.

History of Lutetium

The story of lutetium’s discovery reflects the intense global race to isolate the rare earth elements:

1907 – Discovery: French chemist Georges Urbain first announced the discovery of a new element in a sample of ytterbia and named it lutetium.

A Near Miss: American chemist Charles James had also isolated large amounts of lutetium but delayed publishing his results, allowing Urbain to claim the official credit.

Pure Metal: The first pure sample of lutetium metal was finally produced in 1953, completing the separation of the lanthanides.

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