



### Key Properties

Atomic Mass	168.934
Category	Lanthanides
State at 20°C	solid
Melting Point	1545°C
Boiling Point	1950°C
Density	9.32
Electron Config	[Xe] 4f136s2
Electronegativity	1.25
Year Discovered	1879
Discovered By	Per Teodor Cleve

### Did You Know?

- 1 It is the least abundant of the naturally occurring lanthanides.
- 2 Portable X-ray devices can be powered by a small piece of thulium that has been bombarded with neutrons in a nuclear reactor. The resulting radioactive isotope emits X-rays without needing a large power supply.
- 3 Despite its rarity and high cost, it has been used in lasers.
- 4 Its name comes from Thule, the Ancient Greek and Latin name for a mythical, distant land in the far north, possibly Scandinavia.
- 5 It has a bright, silvery luster but is soft enough to be cut with a knife.

#### APPEARANCE

Thulium is a soft, bright, silvery-gray metal.

#### SUPERHERO PERSONA

*"The Portable X-Ray, the rarest of heroes, who can create X-rays on the go for mobile medical units."*

#### EVERYDAY CONNECTION

Thulium is found in a portable X-ray machine used in field hospitals.

#### POP CULTURE

Thulium is the rarest of the stable lanthanide elements.

### Thulium (Tm): The Medical X-Ray Element

Thulium is a soft, silvery metal from the lanthanide series (rare earth elements). It's one of the rarer lanthanides, but it has a very special use—producing portable X-rays. Its name comes from Thule, an ancient name for Scandinavia, where it was first discovered.

#### Why Is Thulium Useful?

Even though it's rare, thulium has some unique, high-tech applications:

**Portable X-Rays:** When exposed to a nuclear reactor, thulium can form the isotope thulium-170, which gives off gamma rays. Small "buttons" of this isotope are used in lightweight X-ray devices, making it possible to take medical X-rays in remote areas or battlefield conditions without large, heavy machines.

**Lasers:** Thulium is also used in surgical lasers that can cut and cauterize tissue with high precision, making operations safer and reducing healing time.

#### Biological Role & Natural Abundance

Thulium has no known biological role and is considered non-toxic.

It is never found in pure form in nature but occurs in tiny amounts in minerals like monazite. Extracting it requires complex chemical separation, such as ion exchange and solvent extraction. The pure metal can be obtained by reducing its fluoride with calcium or its oxide with lanthanum.

#### History of Discovery

1879 – **Discovery:** Swedish chemist Per Teodor Cleve discovered thulium while studying the mineral erbium, realizing it contained hidden new elements. He isolated the new element and named it after Scandinavia.

1911 – **Purification:** American chemist Theodore William Richards refined thulium to an ultra-pure state after an incredible 15,000 recrystallizations of thulium bromate! This allowed him to determine its atomic weight with great accuracy.