Gallium (Ga)

Element 31 — Complete Summary

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31
Ga
Gallium
69.723

Key Properties

Atomic Mass	69.723
Category	Post-Transition Metals
State at 20°C	solid
Melting Point	29.7646°C
Boiling Point	2229°C
Density	5.91
Electron Config	[Ar] 3d104s24p1
Electronegativity	1.81
Year Discovered	1875
Discovered By	Paul-Émile Lecoq de Boisbaudran

✨ Did You Know?

1. It is famous for its low melting point of 29.76 °C (85.58 °F), which means it will melt into a silvery liquid in your hand.
2. Despite its low melting point, it has a very high boiling point of 2400 °C (4352 °F), giving it one of the largest liquid ranges of any metal.
3. Gallium has the unusual property of expanding when it freezes, similar to water.
4. Spoons made of gallium will dramatically melt and disappear when used to stir a hot drink, making for a popular science prank.
5. Gallium arsenide (GaAs) is a crucial semiconductor used in high-frequency electronics, like the circuits in cell phones.

APPEARANCE
Gallium is a soft, silvery-blue metal that is liquid near room temperature.

SUPERHERO PERSONA
"The Meltdown, a tricky hero who can liquefy in the palm of a hand to escape any situation."

EVERYDAY CONNECTION
Gallium is found in the blue/violet LEDs in electronic displays.

POP CULTURE
Gallium is famous for spoons that melt in hot tea a classic science prank seen in many online videos.

Overview of Gallium

Gallium is a soft, silvery-white post-transition metal with atomic number 31. It is best known for its unusually low melting point of just 29.8 °C (85.6 °F)—warm enough to melt in the palm of your hand. Despite this, it also has a very high boiling point (about 2400 °C / 4352 °F), giving it a wide liquid range that makes it especially useful in scientific and industrial applications.

Uses of Gallium

Gallium is an important element in modern technology, particularly in electronics and optoelectronics:

Semiconductors: Gallium arsenide (GaAs) and gallium nitride (GaN) are key semiconductor materials, often used where silicon is less effective.

LEDs and solar panels: GaAs is used in red LEDs and high-efficiency solar panels, including those on satellites and spacecraft such as the Mars Exploration Rover.

High-tech devices: GaN is used in Blu-ray technology, smartphones, blue and green LEDs, and high-frequency power electronics.

Low-melting alloys: Gallium alloys with most metals, forming low-melting mixtures used in electric fuses, thermal switches, and medical thermometers as a safer alternative to mercury.

High-temperature thermometers: Because of its high boiling point, gallium is also used in thermometers designed to withstand temperatures that would vaporize mercury.

Natural Occurrence and Production of Gallium

Gallium does not occur in its free state in nature. Instead, it is found in trace amounts in minerals such as bauxite and sphalerite.

By-product metal: Most commercial gallium is obtained as a by-product of zinc and aluminum refining.

Extraction: It is typically separated through the electrolysis of gallium(III) hydroxide.

History of Gallium

1871 – Prediction by Mendeleev: Dmitri Mendeleev predicted the existence and properties of gallium, which he called eka-aluminum. He correctly forecast its atomic weight, density, and chemical behavior, and the later discovery confirmed his periodic table.

1875 – Discovery: French chemist Paul-Émile Lecoq de Boisbaudran discovered gallium while analyzing the spectrum of a zinc ore, noticing an unexpected violet line. He later isolated the pure metal, naming it gallium after France (Gallia in Latin).

Biological Role of Gallium

Gallium has no known biological role. It is considered non-toxic and has even been investigated for potential medical applications, including anti-cancer drugs and treatments for bone disease, though these are experimental.