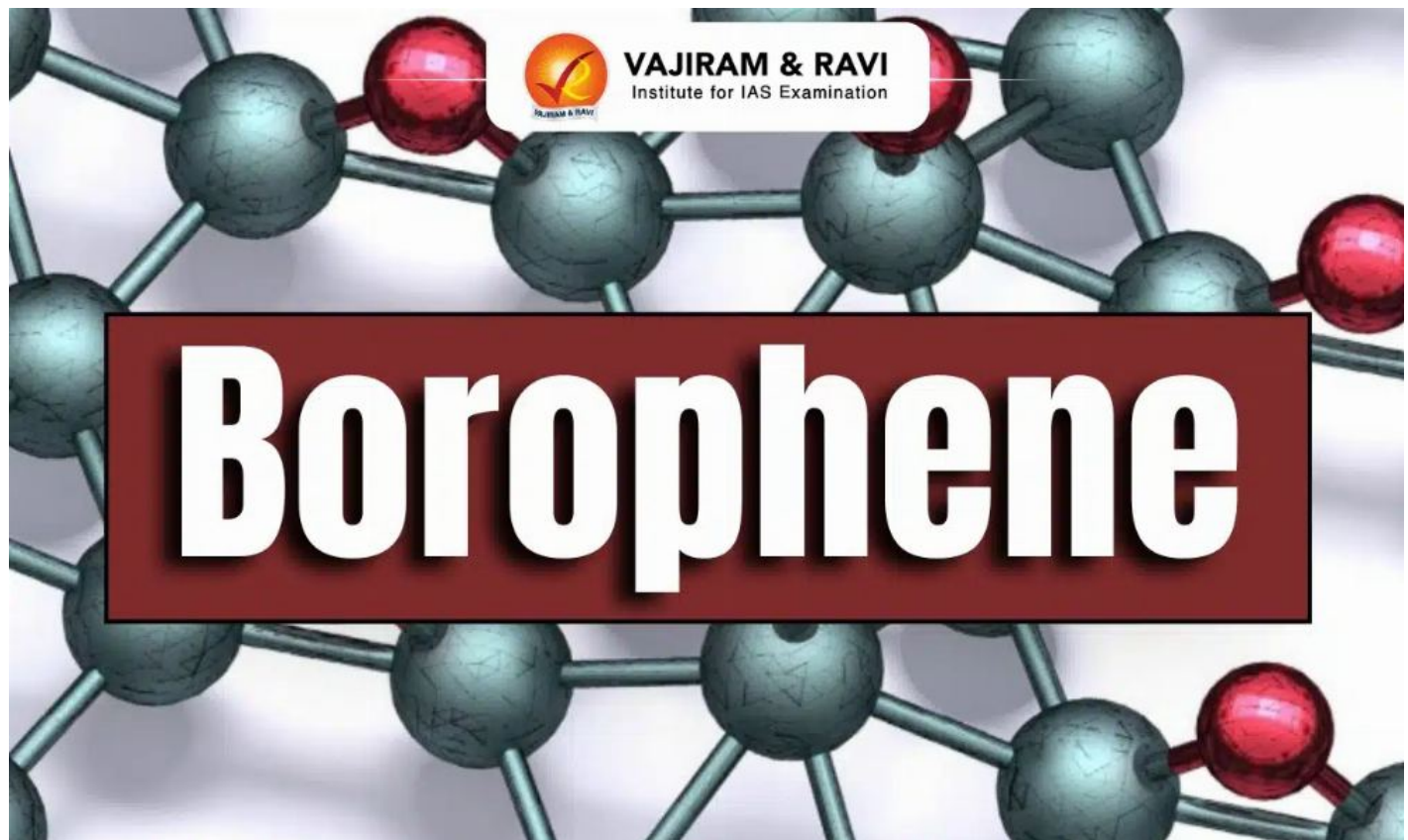


Borophene

July 23, 2026 • vajiramandravi.com



Borophene Latest News

Scientists in India recently achieved a significant breakthrough in sustainable lubrication by demonstrating, for the first time, the use of borophene as a high-performance lubricant additive in castor oil.

About Borophene

- It is an **allotrope of boron**.
- It is composed of a **single-atom-thick sheet of boron atoms** arranged in a **two-dimensional (2D) lattice**.
- **Unlike graphene, which consists** of carbon atoms in a **perfect hexagonal structure**, **borophene is highly polymorphic** — meaning its atomic **structure can vary** depending on the synthesis conditions, leading to **multiple possible configurations**.
- First predicted by theory in the mid-1990s, different borophene structures were **experimentally confirmed in 2015**.
- **Properties:**

- It is known for its **ultra-light weight, flexibility, and exceptional strength**.
- It has excellent properties, including **thermal and electrical conductivity, high capacitance, metallic nature**, etc.
- Its electrical and mechanical **properties vary with direction**, offering **tunable features** for specialized applications.
- It is **highly reactive**, allowing strong interaction with other atoms or molecules, which is **valuable in catalysis, energy storage, and sensor technologies**.
- Due to these outstanding properties, borophene is mainly used in a range of **applications** in the fields of **thin-layer electronics, optoelectronics, capacitors, and biosensors**.

Why Are Recent Findings Important?

- **Friction and wear** are **major causes of energy loss and equipment failure** in industries worldwide.
- **Developing advanced lubricants** that can effectively minimize these losses is therefore a key scientific and technological challenge.
- While **castor oil** is an **attractive renewable and biodegradable lubricant**, its **performance** can be further **enhanced using suitable additives**.
- The **recent study** found that adding **just 0.1 percent borophene by weight to castor oil reduced friction by around 42 percent** compared to pure castor oil, while also improving wear resistance and load-bearing capacity.
- The researchers found that **borophene disperses uniformly in castor oil** without requiring chemical modification.
- During operation, it **forms a durable protective layer, known as a tribofilm**, comprising iron oxides, carbon-based compounds, and boron-containing compounds.
- **This layer reduces shear stress, protects contact surfaces, and minimises wear.**
- This research has the potential to **transform the lubrication industry by advancing renewable energy systems, marine applications, green lubrication technologies**, and sustainable manufacturing.

News: DST

Source: <https://vajiramandravi.com/current-affairs/borophene/>

© Vajiram & Ravi. For personal use only.