

Stable Isotopes of Boron

Isotope	Atomic Mass	Natural Abundance	Nuclear Spin	Nuclear Magnetic Moment
B-10	10.0129370	19.90%	3	1.80065
B-11	11.0093055	80.10%	3/2	2.688637



Boron was discovered in 1808 by Sir Humphry Davy, Joseph Louis Gay-Lussac and Louis Jacques Thénard. Its name derives from the Arabic word *buraq* or the Persian word *burah*, both of which are names for the mineral *borax*.

Boron is a nonmetallic element, either a black, hard solid or a brown, amorphous powder. It is one of the least reactive elements on the periodic table; it does not react with water at ambient temperatures, although the powdered amorphous form reacts slowly at 100 °C, producing boric acid. It reacts vigorously with concentrated nitric acid and ignites in oxygen at 700 °C.

The amorphous boron metal reacts slowly with dilute mineral acids at ambient temperatures. Boron also reacts with halogens to form boron halides, instantaneously with fluorine but at elevated temperatures with other halogens (chlorine, bromine and iodine, at 400 °C, 600 °C, and 900 °C respectively).

Enriched boron is used in radiation shielding and is the primary nuclide used in neutron capture therapy of cancer. Boron-10 is used in nuclear reactors for reactivity control and in emergency shutdown systems. Boric acid is added to reactor coolant when the plant is shut down for refueling. Boron-10 and -11 are of use in nuclear magnetic resonance (NMR) spectroscopy.

In its elemental form, boron is nontoxic — it is actually a plant micronutrient. Rubbing the amorphous powder on the skin, however, can produce irritation. Some compounds of boron are poisonous.

Properties of Boron

Name	Boron
Symbol	B
Atomic number	5
Atomic weight	10.811
Standard state	Solid at 298 °K
CAS Registry ID	7440-42-8
Group in periodic table	13
Group name	None

Properties of Boron (continued)

Period in periodic table	2
Block in periodic table	p-block
Color	Black
Classification	Semi-metallic
Melting point	2075 °C
Boiling point	2550 °C
Vaporization point	4000 °C
Thermal conductivity	0.274 W/(m·K) at 298.2 °K
Electrical resistivity	1.8 x 10 ¹² μΩ·cm at 0 °C; 3.0 x 10 ⁶ Ω·cm at 100 °C
Electronegativity	2.0
Specific heat	1030 J/(kg·K)
Heat of vaporization	507 kJ·mol ⁻¹ at 2550 °C
Heat of fusion	50 kJ·mol ⁻¹
Density of solid	2.34 cryst. g/cm ³
Density of powder	2.45 g/cm ³
Electron configuration	[He]2s ² 2p ¹
Oxidation state	+3
Mohs hardness scale	9.3