

# Life depends on **boron**

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**A**s one of the 109 elements that make up the planet, it's not surprising that boron is all around us — in soil and water, plants and animals.

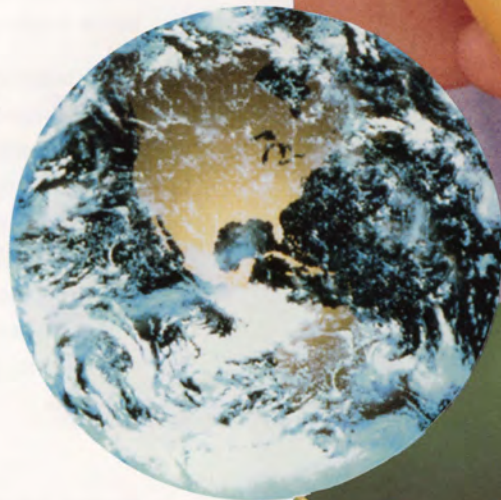
Although the element boron does not exist by itself in nature, it occurs in combination with oxygen and other elements in salts, commonly called "borates."

Just as borates have been a part of nature since the earth's formation, they have also been put to many productive uses since the beginning of civilisation. Artisans in ancient cultures relied on borates, as do glassmakers and potters today. Before the 19th century, concentrated borates were a rare treasure, transported from the Far East into Europe along trade routes taken by Marco Polo's caravans. Today, deposits of borates large enough to mine efficiently are still rare, but usage has increased to the point that most industries on every continent use boron compounds to manufacture products that are essential to modern life.

Although you may not be aware of them, borates are all around you in all aspects of your life.

Here are some places you can find them ...

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## Boron in plants and soil

Although the first verifiable use of borates dates back to the 8th century AD, mankind has relied on them unknowingly since the advent of agriculture, nearly 10,000 years ago. In fact, plants cannot grow without boron. Boron is an essential micronutrient, integral to a plant's life cycle. Required only in small amounts, boron is necessary in plants to control flowering, pollen production, germination, and seed and fruit development. It also acts as a fuel pump, aiding the transmission of sugars from older leaves to new growth areas and root systems.

While boron is naturally present in all soil, there are some regions where heavy rainfall, geological characteristics or farming practices have leached the boron from the land, leaving too little to support plant and crop survival. It's not surprising that fertilisers are one of the main products formulated with borates. Fertilisers containing borates have proven effective in increasing the productivity of soil in regions where natural borate levels are low. Some crops require relatively large supplements of boron, too, including cotton, corn, alfalfa and soybeans.

## Boron in food

As plants draw borates from the soil, the boron is distributed throughout the stems, leaves, roots and other structures. When people eat plant-derived foods — like fruits, vegetables, nuts and legumes — they routinely absorb small amounts of boron. Studies indicate that people in a wide variety of cultures consume about one to three milligrams of boron per day through a combination of foods and drinking water in their local diets. Although it has not yet been proven that humans need boron to live, there is almost universal agreement in the scientific community, including the World Health Organisation, that boron is nutritionally important to maintain optimal human health. Most of us probably ingest a healthy amount of boron each day as a result of our normal fruit and vegetable intake. If not, many beverages, including coffee, wine and beer, do the job as well.

Our bodies are very familiar with boron in our environment and they efficiently manage our daily dietary intake by using what is required and excreting the rest. In fact, regardless of the source of boron exposure, once it is ingested or inhaled our bodies handle it just as they do any other nutrient.



## Boron at home

Apart from the boron in your environment, B is a key ingredient in an extensive range of products.

Borates in roofing materials, wallboard, cellulose insulation protect us from the weather. In the wood, plastic, bricks, pipes and your home, borates protect from moisture and in some applications, act as a fire retardant.

Inside the home, you can find borates in floor tiles, floors and walls and the porcelain in toilets, refrigerators, pots and pans. The borates in your food, but you can also find them in many household cookware and the lead-free crystal glassware.

Move to the bathroom and borates are found in face lotions, makeup, shaving cream, hair straighteners, eye drops, and foot powders. Cleaners, cleaners and adhesives, are all made with borates.

Getting dressed each day requires a lot of products that wouldn't exist without boron to enable them to be made. Nylon processing depends on borates. The clothes that clean is an array of detergents, soaps and bleaches made with borates. Coffee filters, coffee cleaners are also borate-based. Even the glue you have borates in the adhesive that holds the clothes together.

When the house is clean, meals are prepared and finished, you can still find borates in many products. All fibreglass sporting equipment — from tennis rackets to clubs to snowmobiles and jet skis. LCDs in digital watches, laptop computers and even cyberpets also contain borates.

Having a barbecue? Don't forget the borates in the charcoal in the grill, the film in your swimming pool as a water treatment. Borates are a natural rid of uninvited barbecue guests and are effective against termites, beetles, and earwigs. In bright light, borates in sunglasses protect your eyes; at night,





## **Boron** at home

Apart from the boron in your environment and diet, the element B is a key ingredient in an extensive array of household products.

Borates in roofing materials, wallboard, and both fibreglass and cellulose insulation protect us from the elements. As a treatment for the wood, plastic, bricks, pipes and wires used to construct your home, borates protect from mould, rot, fungi and insects, and in some applications, act as a flame retardant.

Inside the home, you can find borates in the ceramic tiles on the floors and walls and the porcelain enamel covering sinks, refrigerators, pots and pans. The pantry is loaded with borates in food, but you can also find them in your everyday heat-resistant cookware and the lead-free crystal you bring out for guests.

Move to the bathroom and boron abounds. Soaps, cold creams, face lotions, makeup, shaving cream, contact lens solutions, hair straighteners, eye drops, and foot soaks, as well as denture cleaners and adhesives, are all made with boron compounds.

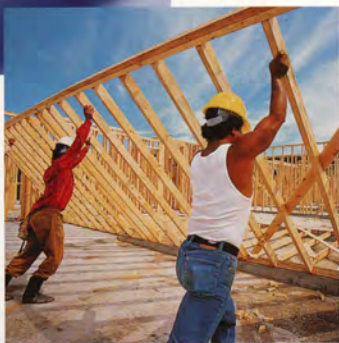
Getting dressed each day requires borates, too. Cotton fabrics wouldn't exist without boron to ensure fibre yield in the field, and nylon processing depends on borates too. Keeping those clothes clean is an array of detergents, laundry boosters and bleaches made with borates. Coffee pot cleaners and carpet cleaners are also borate-based. Even these products' packaging have borates in the adhesive that holds them together.

When the house is clean, meals are cooked, and the laundry finished, you can still find borates at work. They're used to make all fibreglass sporting equipment — from surfboards, and golf clubs to snowmobiles and jet skis. The liquid crystal displays (LCDs) in digital watches, laptop computers, VCRs and cyberpets also contain borates.

Having a barbecue? Don't forget the borates. They're in the charcoal in the grill, the film in your camera, and even the swimming pool as a water treatment. Borates can even help get rid of uninvited barbecue guests as pest control products effective against termites, beetles, ants, cockroaches, silverfish and earwigs. In bright light, borates in your light-sensitive sunglasses protect your eyes; at night, they sparkle in fireworks.







## **Boron** in industry

It would be as hard to find a green plant without boron as it would be to find a borate-free industrial plant. Borates are in magnets, sandpaper and grinding wheels.

In the transportation sector, borates are used to make antifreeze, motor oil, brake fluid and power steering fluid for cars, trucks and aircraft. There are borates in your halogen headlights, and in the lights that line the 32-mile Channel Tunnel that connects England and France.

High tech manufacturers need borates to make capacitors, transistors, semiconductors and other microelectronics that build the computers that connect the world. If you still insist on hard copy, consider that borates also improve the quality and brightness of recycled paper.

Nuclear energy producers use borates in their containment and protection systems. In addition to protecting, borates preserve. They're used to restore historic buildings and ships, as well as for drying flowers and taxidermy.

Scientific glassware — from laboratory vessels to microscopes and telescopes — is made with borates. Medicine also relies on boron compounds for cancer treatment and pharmaceutical production.

The arts and entertainment industry relies on borates for everything from art glass and gold and silversmithing to building communications satellites.

Very few modern industries can get by without borates, and very few people can get by without their products. When you consider the role boron plays in plant life, and by extension, all life, it's hard to imagine our world without it.

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