

What are borates?

Borates are naturally-occurring minerals containing boron, the fifth element on the Periodic Table. Trace amounts exist in rock, soil and water. Plants need them to grow. People need borates, too, as an important part of a healthy diet and an essential ingredient in many products necessary for an acceptable standard of living.

The element boron does not exist by itself in nature. Rather, boron combines with oxygen and other elements to form boric acid, or inorganic salts called borates. Despite the millions of tons of industrial borates mined, processed and distributed around the world every year, far larger quantities of boron are transferred around the planet by way of natural forces. Rain, volcanic activity, condensation and other atmospheric activities redistribute at least twice as much boron as all commercial practices combined.

Multiple properties – manifold uses

The key to the borate industry's strength also lies in nature: specifically, the nature of borates' structural and bonding characteristics. In living systems, these characteristics make borates vital to metabolism – the fundamental way in which organisms translate food into energy. Borates abound in industrial systems as well, for two reasons.

First, they're safe. Used for centuries, borates pose no risk to people, animals or the environment under normal handling and use. Even those who handle borates every day have experienced no adverse health effects. Second, they're versatile. In some applications, there is simply no substitute for borates. In other products and processes, their natural functions impart a wide range of performance, cost, environmental health and safety advantages.

Metabolising Effects – In certain organisms, borates can inhibit metabolic processes. This makes them useful in controlling insects, bacteria and fungi in everything from construction timbers to cosmetics.

Bleaching Effects – Another key chemical effect comes into play in laundry detergents and other cleaning products, where borates are important components in bleaching and stain removal.

Buffering Effects – The chemical properties of borates serve to balance acidity and alkalinity in many applications. Detergents, fireworks and film processing solutions all rely on borates for a stable pH.

Dispersing Effects – Borates are able to bond with other particles to keep different ingredients dispersed evenly and



are used to control viscosity in paints, adhesives and cosmetics.

Vitrifying Effects – Borates modify the structure of glass to make it resistant to heat or chemical attack. In the same way, they facilitate the production of ultra-thin LCD screens, functional fiberglass and beautiful ceramic tiles and glazes.

Inhibiting Effects – Borates interact with surfaces containing iron to form a coating which protects the metal from corrosion. They are important additives in products as diverse as antifreeze and aerosol cans.

Flame-Proofing Effects – Combined with zinc, borates are used to retard flames and suppress smoke in polymers. Borates also act as a flame retardant in cellulose insulation.

Neutron-Absorbing Effects – Borates absorb neutrons in applications ranging from nuclear containment shields to treatments for cancer.

Industrial Minerals

Your world is made of them



While borate applications number in the thousands, chief among them are:

- **Agriculture:** Boron is an essential micronutrient for plants, vital to their growth and development. Without sufficient boron, plant fertilisation, seeding and fruiting are not possible. On every continent of the world, crop yields and food quality are diminished due to insufficient boron concentrations in the soil. These deficiencies can be corrected with borate fertilisers. In areas of acute deficiency, borates can increase crop yields by 30 to 40 percent.
- **Ceramics:** Borates have been an essential ingredient in ceramic and enamel glazes for centuries, integral to affixing glazes or enamels, and enhancing their durability and lustre. Borates are now gaining acceptance as an essential ingredient in ceramic tile bodies, allowing manufacturers to use a wider range of clays, heightening productivity and decreasing energy usage.
- **Detergents and Personal Care Products:** Borates enhance stain removal and bleaching, stabilise enzymes, provide alkaline buffering, soften water and boost surfactant performance in detergents and cleaners. Their biostatic properties control bacteria and fungi in personal care products. New trials demonstrate that adding borates to laundry soap bars significantly improves their cleaning action and reduce levels of dirt redeposition.
- **Diet:** Not surprisingly, people get the boron they need by eating plant-derived food. Studies indicate that people in a wide variety of cultures consume 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 proved that humans need boron to live, there is almost universal agreement in the scientific community that boron is nutritionally important to maintain optimal health.
- **Fibreglass:** Borates are an important ingredient in both insulation fibreglass – which represents the largest single use of borates worldwide – and textile fibreglass,

used in everything from circuit boards to surfboards. In both products, borates act as a powerful flux and lower glass batch melting temperatures. They also control the relationship between temperature, viscosity and surface tension to create optimal glass fiberisation.

- **Glass:** Borosilicate glass is the foundation for all heat-resistant glass applications and the myriad products they make possible – from cathode ray tubes to Pyrex® cookware. Borates increase the mechanical strength of glass, as well as their resistance to thermal shock, chemicals and water.
- **Polymer Additives:** Zinc borates are used primarily as a fire retardant synergist in plastics and rubber applications. They can also function as smoke and afterglow suppressants, anti-tracking agents, and can be used in polymers requiring high processing temperatures. Zinc borates can be found in polymers ranging from electrical parts and automobile interiors to wall coverings and carpeting.
- **Wood Treatments:** Borate treated wood is on the rise as a safe and long-lasting method to protect homes and other structures from wood-destroying organisms. Borate-based preservatives can be used to treat solid wood, engineered wood composites and other building materials like studs, plywood, joists and rafters. Borates prevent fungal decay and are deadly to termites, carpenter ants and cockroaches – but are safe for people, pets and the environment.

For more information, please contact:

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