PRODUCT DATA SHEET

Optibor®

H_3BO_3
Orthoboric acid
Boric acid
Grades: 3C Granular; BQ (Battery Quality); EMP GMP Granular, Powder, and Special Powder; EP Granular and Powder; HP Granular; MG Granular and Powder; NF Granular and Powder; SQ Granular; Technical Granular, Powder, Powder (Europe), and Powder Extra Fine
CAS Number 10043-35-3

Industrial optimization powerhouse

Optibor® is a pure, multi-functional source of boric oxide (B_2O_3). *Optibor* boric acid (H_3BO_3) is theoretically composed of boric oxide and water. Crystalline in composition and white in appearance, it is available as granules or powder.

Applications

Glass and fiber glass

The B_2O_3 in *Optibor* is both a flux and network former; it assists the melt and influences final product properties. In fiber glass, it reduces melting temperatures and helps the fiberizing process. Generally, B_2O_3 lowers viscosity, controls thermal expansion, inhibits devitrification, increases durability and chemical resistance, and reduces susceptibility to mechanical or thermal shock.

Optibor may be used in combination with a sodium borate (borax pentahydrate or anhydrous borax) in order to adjust the sodium to boron ratio in glasses that require low sodium levels. This is important in borosilicate glass where B_2O_3 provides essential fluxing properties at low sodium and high alumina levels.

Frits, glazes, and enamels

For the glassy surfaces of ceramics and enamels, it acts as both network former and flux. *Optibor*:

- Initiates glass formation (at low temperatures)
- Ensures thermal fit between glaze and body
- Reduces viscosity and surface tension
- Increases refractive index
- Enhances strength, durability, and scratch resistance
- Facilitates lead-free formulations

High-boron frits mature rapidly; improve the speed at which smooth, even glaze surfaces develop; and provide good bases for coloring oxides. *Optibor* is used as the B_2O_3 source in the formulation of fast fire frits for tiles because of their requirement for low sodium levels.

Flame retardancy

Incorporated into cellulose materials, borates change the oxidation reactions and promote the formation of char, thereby inhibiting combustion. *Optibor*, alone or in combination with borax, is particularly effective in reducing the flammability of cellulose insulation, wood composites, and cotton batting used in mattresses.

Glass type	Thermal expansion	Melting temperature	Melting rate	Glass viscosity	Surface tension	Chemical resistance
Textile fiber glass (E-glass)		X	X	X	X	
Borosilicate glass	X	X	X	X		X
Glazes and enamels	X	X	X	X	X	X

Reduction in linear coefficient of expansion in glass when silica is replaced proportionately by boric acid. This facilitates “thermal fit” in ceramic glazes and heat resistance in borosilicate glass. Source: *Glass* by Horst Scholze 1991

Optibor®

20 MULE TEAM BORAX™

Batteries and capacitors

Optibor BQ (short for "battery quality") is a highly pure, powder-grade orthoboric acid (H_3BO_3), specifically designed for use in the battery and capacitor industry. It features a very fine particle size distribution, which supports the precision necessary for modern battery applications.

In wet capacitors forming an effective dielectric oxide film between your metallic conducting plates is critical and *Optibor* BQ is ideal for this purpose.

One major application of *Optibor* BQ is the cathode active materials (CAM) production process, where it can be applied directly as a minor additive or processing aid. Using boron in cathode materials can improve the cycling performance and battery lifespan.

Metallurgy

Prevents the oxidation of metal surfaces in welding, brazing, or soldering. It is also used as a source of boron for strengthening metal alloys and steel.

Corrosion inhibition

Incorporated in many aqueous and non-aqueous systems requiring corrosion inhibition, lubrication, or thermal oxidative stabilization. *Optibor* is also used in the manufacture of lubricants, brake fluids, metalworking fluids, water treatment chemicals, and fuel additives.

Adhesives

As part of the starch adhesive formulation for corrugated paper and paperboard, and as a peptizing agent in the manufacture of casein-based and dextrin-based adhesives, *Optibor* greatly improves the tack and green strength of the adhesive by crosslinking conjugated hydroxyl groups.

Chemical reactions

In the manufacturing of nylon intermediates, *Optibor* catalyzes the oxidation of hydrocarbons and increases the yield of alcohols by forming esters that prevent further oxidation of hydroxyl groups to ketones and carboxylic acids. They are also used in preparing various important industrial products such as boron halides, borohydride, fluoborates, metallic borates, borate esters, and boron containing ceramics.

Nuclear energy

Being a highly effective absorber of thermal neutrons, the boron-10 isotope is essential to the safety and control systems of nuclear power stations. *Optibor* SQ and HP grades are made for the nuclear industry and can be isotopically enriched to increase the available proportion of boron-10.

Personal care products

Optibor EP and NF grades are used in cosmetics, toiletries, and pharmaceuticals. It is used in conjunction with sodium borates for pH buffering, and as a crosslinking agent to emulsify waxes and other paraffins.

Additional applications

- Dye stabilization
- Electroplating
- Electrolytic capacitors
- Leather processing and finishing
- Sand-casting (magnesium)
- Textile finishing
- Paints

Optibor®

20 MULE TEAM BORAX™

Theoretical chemical composition	
% B_2O_3	56.30%
%H_2O	43.70%

Characteristics	
Molecular weight	61.83 g/mol
Specific gravity	1.50 g/cm^3
Melting point	171 °C (340 °F)
Heat of solution (absorbed) 1 wt % at 18 °C (64 °F)	364,000 J/kg (156.5 BTU/lb)
Bulk density	881 kg/m^3 (55 lb/ft^3)

Solubility in other solvents		
Organic solvent	**Temp °C (°F)**	***Optibor* % by weight in saturated solution**
Glycerol (98.5%)	20 (68)	19.90
Propylene glycol	20 (68)	21.10
Ethylene glycol	25 (77)	18.5
Diethylene glycol	25 (77)	13.60
Ethyl acetate	25 (77)	1.50
Acetone	25 (77)	0.60
Glacial acetic acid	30 (86)	6.30
Methanol	25 (77)	21.96
Ethanol	25 (77)	11.96
1-Propanol	25 (77)	7.40
1-Butanol	25 (77)	5.28
2-Methyl-1-butanol	25 (77)	4.33

Solubility in water	
Temperature °C (°F)	***Optibor* % by weight in saturated solution**
0 (32)	2.52
5 (41)	2.98
10 (50)	3.49
15 (59)	4.08
20 (68)	4.72
25 (77)	5.46
30 (86)	6.23
35 (95)	7.12
40 (104)	8.08
45 (113)	9.12
50 (122)	10.27
55 (131)	11.55
60 (140)	12.97
65 (149)	14.42
70 (158)	15.75
75 (167)	17.41
80 (176)	19.10
85 (185)	21.01
90 (194)	23.27
95 (203)	25.22
100 (212)	27.53
103.3 (217.9)*	29.27

*Boiling point of solution

PRODUCT DATA SHEET

Optibor®

Hydrogen ion concentration Aqueous solutions of *Optibor* are mildly acidic; the pH decreasing with increasing concentration	
%H_3BO_3 by weight of solution	**pH @ 20 °C (68 °F)**
0.1	6.0
0.5	5.6
1.0	5.1
2.0	4.5
3.0	4.2
4.0	3.9
4.72 (saturated)	3.7

pH

In solution, *Optibor* is mildly acidic.

Melting point

When heated above 100 °C (212 °F) in the open, *Optibor* gradually loses water first changing to metaboric acid (HBO_2) of which three monotropic forms exist. These have melting points respectively of 176 °C (348.8 °F), 201 °C (393.8 °F), and 236 °C (456.8 °F). Dehydration stops at the composition HBO_2 unless the heating time is extended or the temperature rises above 150 °C (302 °F). On continued heating and at higher temperatures, all water is removed leaving the anhydrous oxide (B_2O_3) the crystalline form of which melts at 450 °C (842 °F). The amorphous form has no definite melting point, softening at about 325 °C (617 °F) and becoming fully fluid at about 500 °C (932 °F).

Stability

Optibor in both granules and powder is a stable crystalline product that does not change chemically under normal storage conditions. Wide fluctuations in temperature and humidity can cause recrystallization at particle contact points, resulting in caking. When storing, avoid fluctuations in temperature and humidity, and maintain package integrity.

Optibor is easily handled by means of air or mechanical conveying.

Containers

May be available in bulk, IBCs, or small bags

About U.S. Borax

U.S. Borax is a global leader in the supply and science of borates—naturally-occurring minerals containing boron and other elements. We are 1,000 people serving 650 customers with more than 1,800 delivery locations globally. We supply around 30% of the world's need for refined borates from our world-class mine in Boron, California, about 100 miles northeast of Los Angeles.

About 20 Mule Team products

U.S. Borax produces the *20 Mule Team*® borates family of products from naturally occurring minerals and have an excellent reputation for purity and safety when used as directed. Borates are key ingredients in a number of industrial applications including fiberglass, glass, ceramics, batteries and capacitors, wood preservatives, and flame retardants.

High quality, high reliability, high performance borate products. It's what we're known for.

Notice: Before using these products, please read the Product Specifications, the Safety Data Sheets and any other applicable product literature. The descriptions of potential uses for these products are provided only by way of example. The products are not intended or recommended for any unlawful or prohibited use including, without limitation, any use that would constitute infringement of any applicable patents. Nor is it intended or recommended that the products be used for any described purposes without verification by the user of the products' safety and efficacy for such purposes, as well as ensuring compliance with all applicable laws, regulations and registration requirements. Suggestions for use of these products are based on data believed to be reliable. The seller shall have no liability resulting from misuse of the products and provides no guarantee, whether expressed or implied, as to the results obtained if the products are not used in accordance with directions or safe practices. The buyer assumes all responsibility, including any injury or damage, resulting from misuse of the product, whether used alone or in combination with other materials. THE SELLER MAKES NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE SELLER SHALL HAVE NO LIABILITY FOR CONSEQUENTIAL DAMAGES.