ETİMADEN İŞLETMELERİ GENEL MÜDÜRLÜĞÜ

PRODUCT TECHNICAL DATA SHEET

BORON OXIDE - POROUS

Di-Boron Trioxide (B_2O_3)

CAS Number: 1303-86-2

Technical Grade: Powder

Packaging: 30 kg, 500 kg

(with or without pallet)

General Information:

Boron oxide (diboron trioxide) is available in amorphous glassy form and in crystalline structure with two different forms. The amorphous form is a colorless, odorless, hard and glassy solid and is usually produced by the dehydration of boric acid. The most common crystalline state, hexagonal boron oxide, is stable under normal conditions. The other crystalline state of boron oxide is monoclinic boron oxide, which is less common, and it is not thermodynamically stable under normal conditions. These crystals are hard, white and odorless.

Usage and Benefits:

Glass: It is used as an agent to lower the fusing point and to increase resistance against thermal shocks and the thermal expansion coefficient in glass production. Boron oxide also improves the color and gloss of glass, increases the scratch and acid resistance and reduces the tendency to crystallize. Boron oxide is especially used in

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processes involving the production of borosilicate glass. The boron oxide rate in borosilicate glasses ranges from 1% to 23% depending on the qualities required for the glass. The boron oxide rate ranges between 10-14% in glasses where thermal resistance is desired. The boron oxide rate is between 7-9 in textile grade glass fiber, whereas the boron oxide rate in insulation glass wool is between 5-7%.

Ceramics: Boron oxide is used in ceramics production and enamel glazes. There are various functions of boron oxide in ceramic and enamel glaze formulations. Some examples to such functions are to regulate the the thermal expansion coefficient between the glaze and the material to be glazed; to ensure that the glass formation starts at the very beginning of the fusing; to ensure that the index of refraction of the glaze is high; to increase the gloss of the glaze and provide a decorative appearance; to ensure that the glaze bakes and a smooth surface is obtained by reducing the viscosity and the surface tension of the glaze; to increase the mechanical properties and the scratch resistance of the glaze and to increase resistance against water and chemicals. The rate of boron oxide used in ceramic glazes range between 8-24% by weight. Also, boron oxide is used as an acid inhibitor and stabilizer in the production of ceramic frits and the synthesis of cyanoacrylates.

Special boron chemicals: It is used in the production of inorganic boron compounds such as boron hydrides, boron nitrides, metal borides; and organic boron compounds such as boric acid esters, alkyl aryl boranes, boronic and borinic acids. It is also used in the synthesis of boron carbide which is used in large amounts in the production of many materials such as ceramic armor, electrodes and nozzles. Boron oxide is also preferred in the production of boron nitride which is used in large amounts in cosmetics, oil and refractory material industries. It is also used as a catalyst or in the preparation of catalyst supports in various organic syntheses.

Metallurgy: Due to its nature of acting as a solvent for all metal oxides, it is used as flux in the metallurgy industry. Boron oxide is used for reducing energy consumption by reducing the fusing temperature, for increasing fluidity and for increasing the hardness of steel in metallurgical processes.

Electric and electronic: It is used in the production of Ga-As (Gallium-Arsenic) semiconductors.

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Physical Properties:

Specific weight	: 1.84 g/cm^3
Pour (bulk) density[a]	: 0.629 g/cm^3
Molecular weight	: 69.62 g/mol
Melting point	: 450°C
Boiling point	: 1860 °C
Heat capacity	: 18.6 J/g°C
Thermal conductivity	: 0.138 W/mK
Specific surface area	: <1 m^2/g
Diffusion coefficient	: 1.1x10^{-5} cm^2/s
Surface tension	: 68.32 mN/m (1.0% aqueous solution by weight)
Colorimetry test	: 96.43 (average L value)

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[a] Applies to a representative sample.

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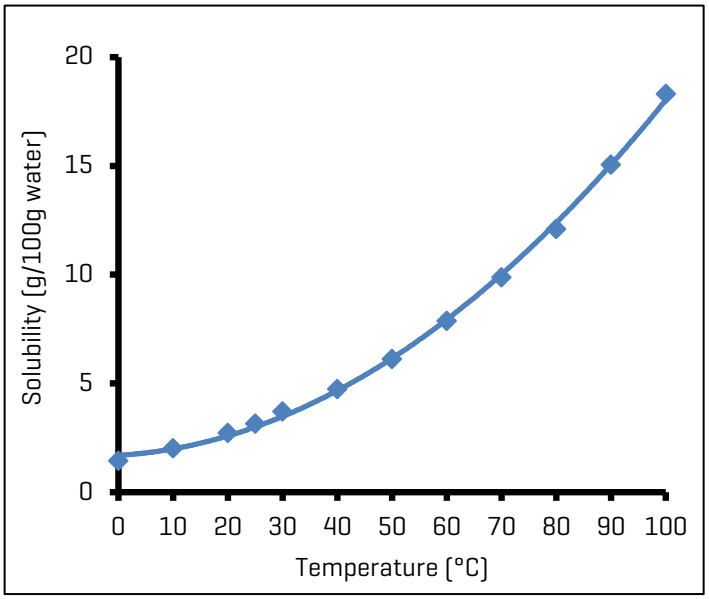
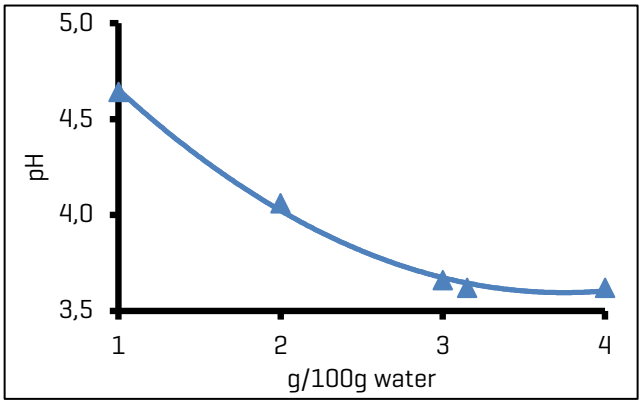
Solubility[b,c]:



Temperature (°C)	Solubility (g/100g water)
0	1.44
10	2.01
20	2.72
25	3.15
30	3.70
40	4.73
50	6.11
60	7.87
70	9.86
80	12.09
90	15.04
100	18.30

Solution pH values:



Solution (g/100g water)	pH (±0.03 / 25°C)
1	4.64
2	4.06
3	3.66
3.15[c]	3.62
4	3.62

[b] Factors affecting the dissolution rate, such as the particle size of material to be dissolved, the mixing speed of the solution are effective on the time to reach the saturation point. The values on the table should be evaluated by taking this into account.

[c] Saturation value of boron oxide-porous at 25°C in 100g water is 3.15g.

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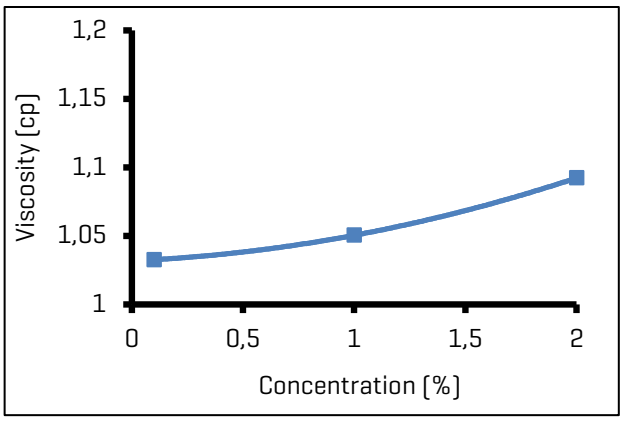
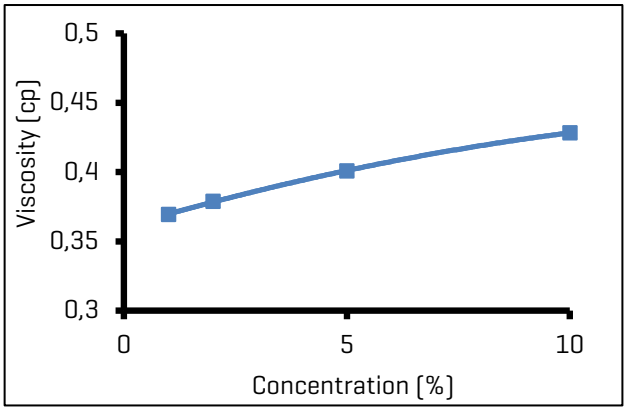
Solution viscosity values:



Temp. (°C)	Conc. (%)	Viscosity (cp)
20	0,1	1.03
20	1	1.05
20	2	1.09



Temp. (°C)	Conc. (%)	Viscosity (cp)
80	1	0.37
80	2	0.38
80	5	0.40
80	10	0.43

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Chemical Content:

Component	Content
B_2O_3	98% min
SO_4	500 ppm max
Cl	10 ppm max
Fe	15 ppm max

Heavy metal content:

Component	Concentration (mg/kg)
As	0.600 max
Cd	<0.005
Pb	<0.010
Cr	<0.005
Hg	<0.010

Particle size:

Size	Content
+0.315mm	75% min

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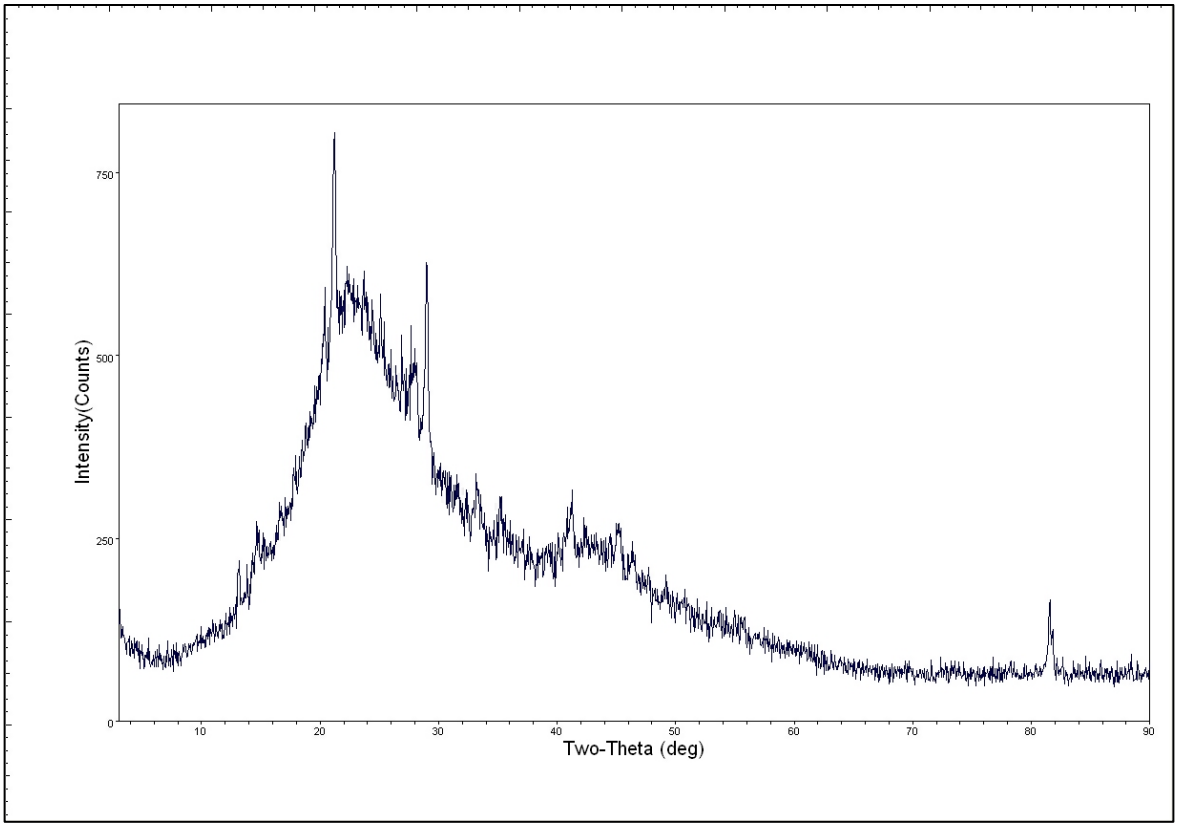
X-Ray Diffraction Analysis:



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