Product Data Sheet

Borax Decahydrate

$Na_2B_4O_7 \cdot 10H_2O$
Sodium Tetraborate Decahydrate
Borax 10 Mol
Technical Grade: Granular and Powder
Technical Grade: 30/70 mesh and 40/200 mesh
European Pharmacopeia (EP): Granular and Powder
National Formulary (NF): Granular and Powder
Special Quality (SQ): Granular and Powder

CAS/TSCA Number 1303-96-4

Borax Decahydrate is the refined form of natural sodium borate. Composed of boric oxide (B_2O_3), sodium oxide, and water, it is a mild, alkaline salt, white and crystalline, with excellent buffering and fluxing properties. Available in powder or granular form, Borax Decahydrate is an important multifunctional source of B_2O_3, particularly for processes in which the simultaneous presence of sodium is beneficial.

Applications and benefits

Soap and detergents

Borax Decahydrate is incorporated in many cleaning products as a pH buffering agent, to aid in the emulsification of oils, and as a gentle abrasive. Borax Decahydrate is added to powdered hand soaps to remove medium to heavy soils encountered in industrial operations. It is gentle to the skin, yet highly effective in removing dirt. Borax Decahydrate is added to formulations to clean hard surfaces such as metals, glass and ceramics. It is also used as an additive in hand cleaners, polishes and waxes, and industrial/institutional cleaning compounds. In laundry detergents it facilitates the removal of oily soils from fabrics, and imparts alkalinity, pH buffering and softening of the wash water. It is also used to stabilize enzymes.

Personal care products

Borax Decahydrate is used in cosmetics, toiletries and pharmaceuticals. In contact lens solutions, it is used in conjunction with boric acid as a gentle cleaner and buffering agent. Borax is also used as a crosslinking agent to emulsify waxes and other paraffins used as a base for lotions, creams and ointments.

Metallurgical fluxes

The ability of Borax Decahydrate to dissolve metal oxides is exploited in the recovery of metals such as brass, copper, lead and zinc from scrap or smelting slag.

In ferrous metallurgy, Borax Decahydrate is used as a cover flux to prevent oxidation at the surface of the molten ingot. In welding, brazing, and soldering, Borax Decahydrate covers the metal surfaces, excluding air and preventing oxidation. It also acts as a solvent and cleaning agent.

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Corrosion inhibition

Borax Decahydrate is incorporated in many aqueous systems requiring corrosion inhibition. It protects ferrous metals against oxidation and finds use in the manufacture of automotive and engine coolant formulations, and various water treatment chemicals.

The high solubility of Borax Decahydrate in ethylene glycol makes it especially useful in car antifreeze formulations. Borax Decahydrate neutralizes the acidic residue resulting from the decomposition of ethylene glycol and minimizes the rate of oxidation at the surface of the metal. Aqueous solutions of Borax Decahydrate have replaced chromates in railroad and other diesel engine coolants.

Adhesives

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

Wire drawing

Borax Decahydrate neutralizes the residual acid from the pickling stage, and the deposit of the salt remaining on the wire is valuable as a carrier of dry powdered lubricant.

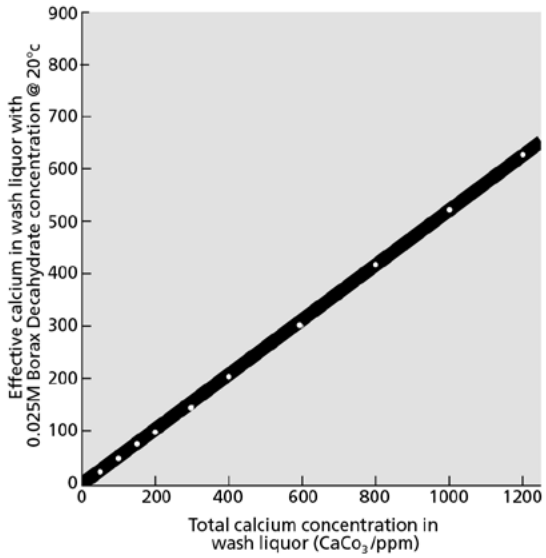
Refractories

Borate Decahydrate compounds are used as stabilizers and bonding agents in specialty abrasives. Borax Decahydrate gives an intermediate-temperature glassy bond prior to the establishment of the ceramic bond, at which point the borate compound is frequently volatilized from the system.

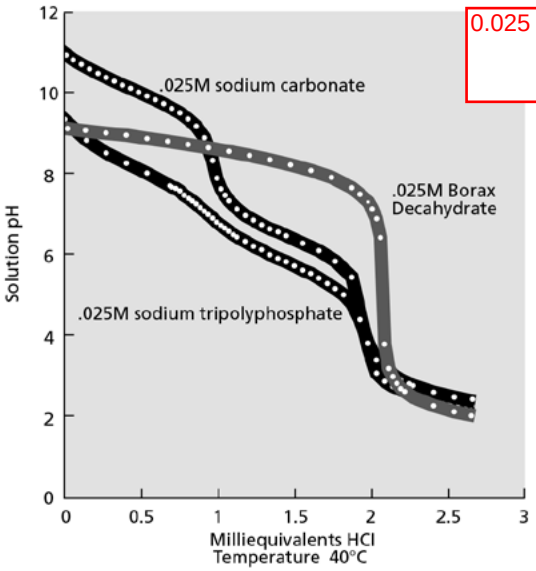
Some other applications

Borax Decahydrate is used as a flame retardant for cellulosic materials, a buffer and catalyst for organic dyes, a carrier for herbicides, a coolant for diesel engines, and a degreasing buffer in enamelling processes.

Water softening (calcium ion sequestration) by Borax Decahydrate in detergents



Borax Decahydrate maintains desired alkalinity in wash liquor by acting as pH buffer



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1/2 cup in 1 gallon = 1/32 = 3.12500%; 3/4 = 4.687500%

Chemical and physical properties

Stability

Borax Decahydrate is chemically stable under normal storage conditions. Borax has a slight water vapor pressure which increases with warmer temperatures. This can cause crystallization at particle contact points, resulting in caking. Borax decahydrate will slowly lose water of crystallization if exposed to a warm, dry atmosphere. Conversely exposure to a humid atmosphere causes caking. When storing the product, care should therefore be taken to avoid wide fluctuations in temperature and humidity, and to ensure that the packaging is not damaged.

Buffering action

Dissolved in water, Borax Decahydrate hydrolyzes to give a mildly alkaline solution. It is thus capable of neutralizing acids. It also combines with strong alkalis to form compounds of lower pH. The relatively constant pH of Borax Decahydrate solutions makes it an excellent buffering agent.

Characteristics	
Molecular Weight	381.37
Specific Gravity	50°C (122°F) (enclosed space)
Onset of Water Loss	26.48%
Heat of Solution (absorbed) 1% @ 32°C (90°F)	4.93×10^5 J/kg (212 BTU/lb)

Solubility in water	
Temperature °C (°F)	Borax Decahydrate % by weight in saturated solution
0 (32)	1.99
5 (41)	2.46
10 (50)	3.09
15 (59)	3.79
20 (68)	4.70
25 (77)	5.80
30 (86)	7.20
35 (95)	9.02
40 (104)	11.22
45 (113)	14.21
50 (122)	17.91
55 (131)	23.22
60 (140)	30.32
65 (149)	33.89
70 (158)	36.94
75 (167)	40.18
80 (176)	44.31
85 (185)	48.52
90 (194)	53.18
95 (203)	58.94
100 (212)	65.63

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Solubility in some solvents		
Organic solvent	Temp °C (°F)	Borax Decahydrate % by weight in saturated solution
Glycerol 98.5%	20 (68)	52.60
Glycerol 86.5%	20 (68)	47.19
Ethylene glycol	25 (77)	41.60
Diethylene glycol	25 (77)	18.60
Methanol	25 (77)	19.90
Aqueous ethanol 46.5%	15.5 (60)	2.48
Acetone	25 (77)	0.60
Ethyl acetate	25 (77)	0.14

water 5.80 @ 25 C

Comparative pH of some common alkalis @ 20°C (68°F)					
Weight%	0.1	0.5	1.0	2.0	5.0
Caustic soda	11.90	12.70	13.10	13.30	13.80
Sodium metasilicate	11.30	12.10	12.30	12.70	13.10
Trisodium phosphate	11.50	11.55	11.60	11.70	11.80
Soda ash	10.70	11.30	11.40	11.50	11.60
Sodium metaborate	10.52	10.84	11.00	11.18	11.44
Borax Decahydrate	9.26	9.23	9.24	9.24	(9.32)*

lye=NaOH

sodium carbonate=

*pH of Borax Decahydrate saturated solution (4.70%)