Product Data Sheet

Potassium Pentaborate

$KB_5O_8 \cdot 4H_2O$
Potassium Pentaborate Tetrahydrate
Technical Grade: Granular and Powder

CAS Number 12229-13-9

Potassium pentaborate is a product resulting from the controlled reaction of potassium hydroxide, water and boric acid. It is a mild alkaline salt and consists of white crystalline granules.

Applications and benefits

Welding/soldering/brazing fluxes

In the joining of metals by silver soldering, brazing or welding, potassium pentaborate is used either alone, or in a mixture with other materials. The borate-containing flux melts and dissolves oxide impurities on the metal surfaces to be joined. It also provides a protective barrier film which prevents further oxidation. Potassium pentaborate is used in fluxes for stainless steel or various non-ferrous metals to avoid the “glare” associated with sodium borate.

Metal refining

In metal refining, borates are used as cover fluxes. Potassium pentaborate is used for refining copper and its alloys, as well as precious metals. It can provide an alternative to typical fluorine-containing flux compounds, and can help reduce fluorine emissions.

Lubricating oil additives

Potassium borates, dispersed in a very finely divided state, improve the load-carrying, anticorrosion, and antiwear properties of industrial and automotive gear lubricants. Under extreme conditions, potassium borates interact with metal load-bearing surfaces to form a film of extraordinary resilience. This tenacious film provides outstanding load-carrying capacity and wear protection.

Diazotype developer

A light-sensitive composition can be produced by combining a nonionic aromatic diazo compound and a cationic dye-borate anion complex. Potassium pentaborate can be used as the source of borate anion.

Cement

The addition of soluble borates such as potassium pentaborate inhibits the set of cement. Slow-setting cements are used in oil well drilling where they may have to be pumped to great depths before being required to harden.

Matches

Wooden and paper matches have been treated with potassium pentaborate solutions for control of the burning rate and to stop after-glow.

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Chemical and physical properties

Theoretical composition	
Boric oxide, B_2O_3	59.36%
Potassium oxide, K_2O	16.06%
Water of crystallization, H_2O	24.58%
Anhydrous equivalent, KB_5O_8	75.42%

Characteristics	
Molecular weight	293.21
Specific gravity	1.74
Onset of water loss	130°C (266°F)

Stability

Potassium pentaborate shows little tendency to cake except after prolonged storage or if it becomes severely wetted by rain or substantial water penetration. It is also capable of absorbing moisture if exposed to a humid environment. When stored under normal conditions of temperature and humidity, potassium pentaborate is unlikely to change chemically or cake. It is, of course, essential to maintain the integrity of the packaging.

Melting point

Heated in a vacuum, the crystalline salt begins to dissolve in its own water at about 130°C (266°F), and continues to lose molecules of water up to about 400°C (750°F). The anhydrous form fuses to a clear glass at 780°C (1435°F).

Hydrogen ion concentration

Aqueous solutions of potassium pentaborate show decreasing pH with increasing concentration:

Potassium Pentaborate (wt.)	pH @ 20°C (68°F)
0.29%	8.47
0.58%	8.38
1.17%	8.36
2.93%	8.00
5.86%	7.60

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Solubility in water, as $KB_5O_8 \cdot 4H_2O$	
Temp °C (°F)	**% by weight**
0 (32)	2.1
5 (41)	2.4
10 (50)	2.8
15 (59)	3.2
20 (68)	3.7
25 (77)	4.3
30 (86)	5.0
35 (95)	5.8
40 (104)	6.8
45 (113)	7.8
50 (122)	9.1
55 (131)	10.5
60 (140)	12.0
65 (149)	13.7
70 (158)	15.5
75 (167)	17.5
80 (176)	19.5
85 (185)	21.8
90 (194)	24.3
95 (203)	27.0
100 (212)	29.6
102.3* (216)	31.0

*Boiling point of saturated solution