

Potassium Pentaborate



Potassium pentaborate tetrahydrate

Grades: Granular and Powder

CAS Number 12229-13-9



Strength and versatility

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.

Diazo type 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 a 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.

Theoretical chemical composition

Boric oxide, B ₂ O ₃	59.36%
Potassium oxide, K ₂ O	16.06%
Water of crystallization, H ₂ O	24.58%
Anhydrous equivalent, KB ₅ O ₈	75.42%

Characteristics

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

Solubility

Solubility in water, as KB₅O₈ · 4H₂O

Temperature °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



pH

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

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).

Stability

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. When storing the product, maintain package integrity.

Containers

May be available in bulk, IBCs, or small bags

About U.S. Borax

U.S. Borax, part of Rio Tinto, 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.

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