20 MULE TEAM®

Potassium Tetraborate

Product Profile

$K_2B_4O_7 \cdot 4H_2O$
Potassium Tetraborate Tetrahydrate
Technical Grade – Granular and Powder
CAS Number 12045-78-2

Potassium tetraborate is a product resulting from the controlled reaction of potassium hydroxide, water and boric acid. It is an alkaline salt with excellent buffering properties and consists of white crystalline granules. Potassium tetraborate replaces borax where an alkali borate is needed but sodium salts cannot be used. Potassium tetraborate is also more soluble in water than borax.

Applications and Benefits

Buffering Agent

When dissolved in water, potassium tetraborate hydrolyzes to give a mildly alkaline solution. It is thus capable of neutralizing acids. It also combines with strong alkalis to lower their pH. The pH of a 2% (wt.) solution of potassium tetraborate is 9.2. The value increases very slightly with increasing concentration, and diminishes very slightly with increasing temperature. The relatively constant pH of potassium tetraborate solutions makes them excellent buffering agents, and these are often recommended as primary standards in analytical procedures.

Welding/soldering/brazing fluxes

Potassium tetraborate is an excellent solvent for metallic oxides at high temperatures. In the field of metallurgy, it is used in the preparation of special welding, soldering and brazing fluxes of stainless steel or various non-ferrous metals to avoid the “glare” associated with sodium borate.

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 tetraborate can be used as the source of borate anion.

Nuclear

Being a good absorber of thermal neutrons, potassium tetraborate is used for emergency shutdowns in nuclear-powered ships.

Chemical and Physical Properties

Theoretical composition

Boric oxide, B_2O_3	45.58%
Potassium oxide, K_2O	30.83%
Water of crystallization, H_2O	23.59%
Anhydrous equivalent, $K_2B_4O_7$	76.41%

Characteristics

Molecular weight	303.53
Specific gravity	1.92
Melting point	100°C (212°F)

Stability

Potassium tetraborate 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 tetraborate is unlikely to change chemically or cake.

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Melting point

Heated in a vacuum, the crystalline salt begins to melt in its own water at about 100°C (212°F), losing two molecules of water. The anhydrous salt is formed at about 400°C (752°F), and fuses to a clear glass at 815°C (1500°F).

Hydrogen ion concentration

Aqueous solutions of potassium tetraborate show a slight decrease followed by a moderate increase in pH with increasing concentration:

Potassium tetraborate (wt.)	pH @ 20°C (68°F)
0.1%	9.18
0.5%	9.14
1.0%	9.15
2.0%	9.20
5.0%	9.20—??

Solubility in water, as $K_2B_4O_7 \cdot 4H_2O$

Temp °C (°F)	% by weight
0 (32)	8.2
5 (41)	10.0
10 (50)	11.8
15 (59)	13.6
20 (68)	15.8
25 (77)	17.8
30 (86)	20.4
35 (95)	22.7
40 (104)	25.4
45 (113)	28.4
50 (122)	31.4
55 (131)	34.3
60 (140)	37.3
65 (149)	40.6
70 (158)	43.6
75 (167)	46.8
80 (176)	50.0
85 (185)	53.6
90 (194)	56.6
95 (203)	60.1
100 (212)	63.3

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