

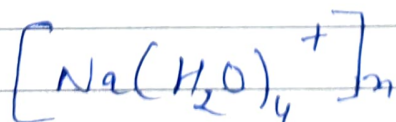
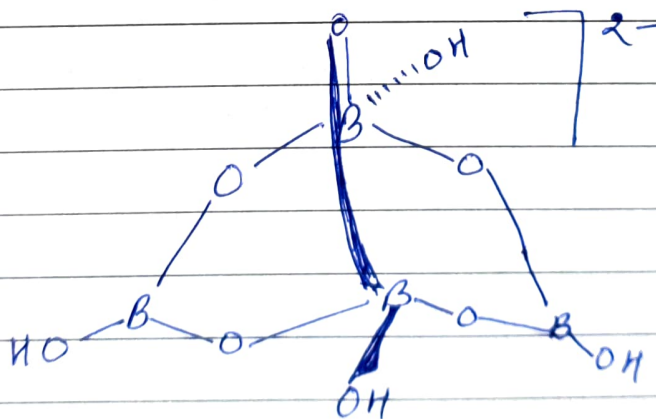
Borax :-

⇒ Borax, also known as sodium borate, sodium tetraborate or disodium tetraborate is an important boron compound, a mineral & a salt of boric acid.

Powered borax is white consisting of soft colorless crystals that dissolve in water. A number of closely related mineral or chemical compounds that differ in their crystal water content are referred to as borax and the word is usually used to refer to the octahydrate.

Commercially sold borax is partially dehydrated

Structure;



IUPAC Name - Sodium tetraborate decahydrate

Common name - Borax decahydrate

Chemical formula ; $(\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O})$ or $\text{Na}_2[\text{B}_4\text{O}_5(\text{OH})_4] \cdot 8\text{H}_2\text{O}$

Molar mass ; 201.22 (Anhyd.)

Melting pt. ; 743°C (Anhyd.)

Uses :-

Borax is a component of many detergents, cosmetics and enamel glazes. It is used to make buffer solutions in biochemistry as a flux in metallurgy, neutron-capture shields for radioactive sources a texturing agent in cooking as a cross-linking agent in slime as a precursor for other boron compounds and along with its inverse boric acid is useful as an insecticide.

In artisanal gold mining borax is sometimes used as part of process (as a flux) meant to eliminate the need for toxic mercury in the gold extraction process, although it cannot directly replace mercury. Borax was reportedly used by gold miners in parts of the Philippines in 1900s.

Discovery :-

Borax was first discovered in dry lake beds in Tibet and was imported via the Silk Road to the Arabian Peninsula in 8th Century AD. Borax first came into

Common use in the late 19th Century when Francis Marion Smith's Pacific Coast Borax company began to market & popularise a large variety of application under the 20 Mule team Borax trademark.

Properties :-

The term borax is often used for a number of closely related minerals or chemical compounds that differ in their crystal water content.

Sodium tetraborate, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$

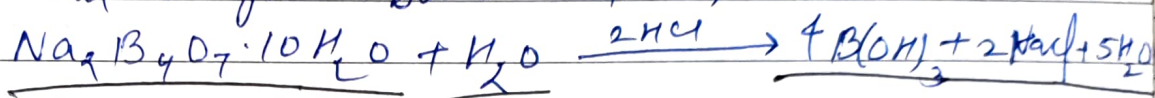
from the chemical perspective, borax contains the $\text{B}_4\text{O}_5(\text{OH})_4^{2-}$ ion. In this structure, there are two four-coordinated boron centres and the two three-coordinate boron centre.

Borax Bead Test;

It is a traditional part of inorganic analysis to test for presence of metals. The oldest one is the "borax bead test". It was introduced by Berzelius in 1812. Since, other salts were used as fluxing agents, such as $(\text{Na}_2\text{CO}_3/\text{NaF})$. The most imp. one after borax is microcosmic salt; which is basis of "Microcosmic salt bead test".

Reactions:-

Borax is also easily converted to boric acid and other borates which have many application. Its reaction with hydrochloric acid to form boric acid is,



The 'decahydrate' is sufficiently stable to find use as a primary standard for acid base titrimetry.

When borax is added to flame, it produces a yellow green colour. Borax is not used for this in fireworks due to the overwhelming yellow colour of sodium. Boric acid is used to colour methanol flame a transparent green.

Borax is very soluble in ethylene glycol moderately soluble in diethylene glycol & methanol, slightly soluble in acetone.

It is poorly soluble in cold water, but its solubility increases significantly with temperature.

Natural Resources :-

Borax occurs naturally in evaporite deposits produced by the repeated evaporation of seasonal lakes. The most commercially important deposits are found in Turkey, Boron, California and Searles Lake, California. Also borax has been found at many other locations in the southwestern United States, the Atacama desert in Chile newly discovered deposits in Bolivia and in Tibet and Romania. Borax can also be produced synthetically from other boron compounds.

Naturally occurring borax (known by the trade name Resorite-46 in United States and many other countries) is refined by a process of recrystallization.

Household Uses :-

Borax is used in various household laundry cleaning products, including the 20 Mule Team Borax laundry booster, Boraxo powered hand soap, and some tooth bleaching formulas.

pH buffer :-

Borate ions (Boric acid) are used in biochemical and chemical laboratories to make buffers.

eg, polyacrylamide gel electrophoresis of DNA and RNA such as TBE buffer (tris-hydroxymethyl aminomethonium) or the newer SB buffer or BBS buffer in coating procedures.

Borate buffers (usually at 8pH) are used as as preferential equilibration solution in dimethyl pimelimidate (DMP) based crosslinking reactions

⇒ Co-Complexing agent :-

Borax as a source of borate has been used to take advantage of the co-complexing ability of borate with other agents in water to form complex ions with various substances. Borate and a suitable polymer bed are used to chromatograph non glycosylated hemoglobin differently from glycosylated hemoglobin (HbA_{1c}) which is an indicator of long hyperglycemia in diabetes mellitus

Water Softening agents,

Borax alone does not have a high affinity for the hardness cations, although it has been used for water-softening. Its chemical equation for water-softening is given below;





The sodium ion introduced do not make water hard'. This method is suitable for removing both temporary & permanent types of hardness.

Other Uses;

□ Medicine;

- Anti fungal foot soak
- Treatment for thrush in horses's hoofs.
- Is found in some commercial vitamins.

⇒ • Ingredients in enamel glazes

• Component of glass pottery & ceramics.

• Used as an additive in Ceramics slips & glaze to improve fit on wet, greenware, & bisque

• fire retardant.

• Anti fungal compound for cellulose insulation

• Moth proofing 10% solution for wool

• Pulverized for the prevention of stubborn pests in closets, pipe and cable inlets, wall

panelling gaps & inaccessible locations where ordinary pesticides are undesirable.

- ① Precursor for sodium perborate monohydrate that is used in detergents as well as for boric acid and other borates.
- ① Trackifier ingredients in Casein, starch and dextrin based adhesives.
- ① Precursor for boric acid, a tackifier ingredient in polyvinyl acetate, Polyvinyl alcohol based adhesives
- ① Fluoride detoxification
- ① To make indelible ink for dip pens by dissolving shellac into heated borax
- ① Curing agent for Snake skins, salmon eggs for use in sport fishing for Salmon.
- ① Swimming pool buffering agent to control pH.
- ① Neutron absorber, used in nuclear reactors.
- ① Preservative in taxidermy
- ① To color fires with a green tint.

- ① Traditionally used to coat dry-cured meats.
- ① for stopping car radiation and engine block leaks
- ① used by blacksmith in forge welding.
- ① used as a woodworm treatment

Toxicity;

Borax, sodium tetraborate decahydrate, acc. to one study is not acutely toxic.

Its LD_{50} score is tested at 2.66g/kg in rats.

Borax is used as an insecticides in US with various restrictions.

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