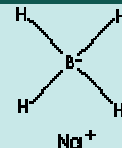


# SODIUM BOROHYDRIDE

## PRODUCT IDENTIFICATION

CAS NO.	16940-66-2
EINECS NO.	241-004-4
FORMULA	NaBH <sub>4</sub>
MOL WT.	37.83
H.S. CODE	2850.00
TOXICITY	Oral rat LD50: 162 mg/kg
SYNONYMS	Sodium tetrahydroborate; SBH;
DERIVATION	
CLASSIFICATION	



## PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	white crystalline powder particle
MELTING POINT	400 C (slowly decomposes above 400 C, completely decompose at higher temperature)
BOILING POINT	
SPECIFIC GRAVITY	1.07 - 1.08
SOLUBILITY IN WATER	Reactive (insoluble in ether and hydrocarbons)
pH	alkaline in sol.
VAPOR DENSITY	
AUTOIGNITION	
NFPA RATINGS	Health: 2; Flammability: 1; Reactivity: 2
REFRACTIVE INDEX	
FLASH POINT	250 C
STABILITY	Not available. Hygroscopic (dangerous when wet)

## GENERAL DESCRIPTION & APPLICATIONS

Sodium borohydride is a milder reducing agent, can be used in aqueous solution. It converts selectively aldehydes and ketones the corresponding alcohols in the manufacture of pharmaceuticals and other fine chemicals. It will not react with esters, amides, or carboxylic acids, the more powerful reducing agent lithium aluminum hydride(LAH) is used to reduce these compounds. LAH is the more powerful reducing agent than sodium borohydride due to the weaker Al-H bond compared to the B-H bond. The reactivity of sodium borohydride can be modified by addition of iodine or methanol in BH<sub>3</sub>-THF to reduce esters into the corresponding alcohols like the reaction of benzyl benzoate to benzyl alcohol. Sodium borohydride is used as a hydrogen source for fuel cell systems and a foaming agent for rubbers. Sodium cyanoborohydride converts certain alcohol groups to methylene groups. Sodium Cyanoborohydride is used as a selective amination reductant. It converts aldehydes (chemoselective), ketones (stereoselective) to the corresponding alcohols in the manufacture of pharmaceuticals and other fine chemicals. It is used in the reductive alkylation of amines, novel metals and oximes. Some examples of reducing agents are:

- Diisobutylaluminum Hydride (DIBAL-H)
- Dimethylsulfide Borane
- Ferrous Ion
- Formaldehyde
- Formic Acid
- Hydrazines
- Hydrogen

- Isopropanol
- Lithium Aluminum Hydride
- Low-valent Metal Compounds
- Phenylsilane
- Polymethylhydrosiloxane
- Potassium Ferricyanide
- Silanes
- Sodium Bis(2-methoxyethoxy)Aluminumhydride
- Sodium Hydrosulfite
- Sodium Amalgam
- Sodium And Potassium
- Sodium Borohydride
- Sodium Cyanoborohydride
- Sodium Dithionite
- Sodium Triacetoxyborohydride
- Stannous Ion
- Sulfite Compounds
- Tin Hydrides
- Triphenylphosphine
- Zinc-mercury Amalgam

#### SALES SPECIFICATION

APPEARANCE	white crystalline powder
CONTENT	98.0% min
WATER	0.1% max

#### TRANSPORTATION

PACKING	30kgs in steel drum
HAZARD CLASS	4.3 (Packing Group: I)
UN NO.	1426

#### OTHER INFORMATION

European Hazard Symbols: T F, Risk Phrases: 15/25/34, Safety Phrases: 18/22

#### GENERAL DESCRIPTION OF HYDRIDE

Hydride is the isolated atomic hydrogen anion,  $H^-$  or any compound containing hydrogen and another element, more electropositive element or group. Hydride consists of a singly charged positive nucleus and two electrons of which one electron is weakly held and readily donative. There are some types of hydrides according to their bonding.

- Ionic hydrides (saline hydrides): the hydrogen obtains an electron from a more electropositive metal, usually one of the alkali metals, to be an anion,  $H^-$ , and behaves like a halogen. Ionic hydrides react vigorously with water with removing hydrogen gas ( $H_2$ ). Compounds that have hydrogen and one other element only is called binary hydrides with general form of  $MH$  or  $MH_2$  such as sodium hydride ( $NaH$ ), lithium hydride ( $LiH$ ), calcium hydride ( $CaH_2$ ), magnesium hydride ( $MgH_2$ ).
- Covalent hydrides: The hydrogen shares one or more pairs of electrons with more electronegative elements (such as boron and aluminium) or nonmetallic elements. Water, ammonia, hydrogen sulfide ( $H_2S$ ), hydrocarbons (alkane, alkene and alkyne), and hydrazine belong to nonmetallic covalent hydrides which behave as molecules and are normally gas or volatile liquids. Hydrogen halides, boranes, silane, phosphines belong to covalent hydrides.
- Metallic hydrides: They are alloy-like materials which have individual properties of metals. Their bondings are vary from element to element.

- Polymeric hydrides: the hydrogen has bridges forming three center bond with other atoms such as boron, aluminum, and beryllium.

Hydrides which carry hydrogen can provide large amounts of heat when burned. They can be used as a component in jet fuels. They are less flammable and less volatile than hydrocarbon fuels. They are relatively environmentally friendly because they degrade quickly in the environment.

Hydrides and hydrido complexes containing this easily polarized ion are highly reactive, strongly basic and powerfully reducing in synthetic reactions. They are important reducing agents in industrial reactions though they are easily destroyed in the relatively acidic compound water ( $\text{H}_2\text{O}$ ) and in air containing dioxygen ( $\text{O}_2$ ). Examples of commercially useful hydride complexes are:

- Sodium or Potassium Hydride: strong base used in organic and inorganic fine chemical synthesis. It is used as a condensation, alkylation and polymerization agent in making other chemical compounds. It is used as a drying agent.
- Sodium or Potassium Borohydride: Used as a selective reductant which can be used in aqueous solution. It converts aldehydes and ketones to the corresponding alcohols in the manufacture of pharmaceuticals and other fine chemicals. It is used as a hydrogen source and a foaming agent for rubbers.
- Sodium Cyanoborohydride: Used as a selective amination reductant. It converts aldehydes (chemoselective), ketones (stereoselective) to the corresponding alcohols in the manufacture of pharmaceuticals and other fine chemicals. It is used in the reductive alkylation of amines, novel metals and oximes.
- Sodium Triacetoxyborohydride
- Lithium Aluminum Hydride: powerful reducing agent used in organic synthesis (for specific linkages in complex molecules).
- Sodium diethyldihydridoaluminate
- Sodium tri- or tert-butoxyhydridoaluminate
- Sodium bis(2-methoxyethoxy) dihydridoaluminate
- Lithium Hydride: flammable, white, translucent solids; decomposes at 850 C; reacts violently with water to yield hydrogen and lithium hydroxide; used as a hydrogen source or reducing agent to prepare other hydrides amides and  $2\text{H}$  isotopic compound, as a shielding material for thermal neutrons.
- Calcium Hydride: white crystals; insoluble in water; used in the production of chromium, titanium, and zirconium through the Hydromet process.
- Titanium Hydride: black metallic powder whose dust is an explosion hazard and which dissociates above 288 C; used in powder metallurgy, hydrogen production, foamed metals, glass solder, and refractories, and as an electronic gas getter.
- Zirconium Hydride: flammable, gray-black powder; used in powder metallurgy and nuclear moderators, and as a reducing agent, vacuum-tube getter, and metal-foaming agent.