# What is Sodium Borohydride?

Sodium borohydride is an inorganic compound whose chemical formula is $NaBH_4$. Under normal conditions, this compound exists as a white, powdery solid. $NaBH_4$is a reducing agent which is widely used both industrially and on the laboratory scale. It can be noted that sodium borohydride is also known as sodium tetrahydroborate and sodium tetrahydridoborate.

## Preparation

Sodium borohydride can be prepared on an industrial scale by treating trimethyl borate with sodium hydride at a temperature range of 250-27°C. The balanced chemical equation for this reaction is given by:

$$4NaH + B(OCH_3)_3 \rightarrow 3NaOCH_3 + NaBH_4$$

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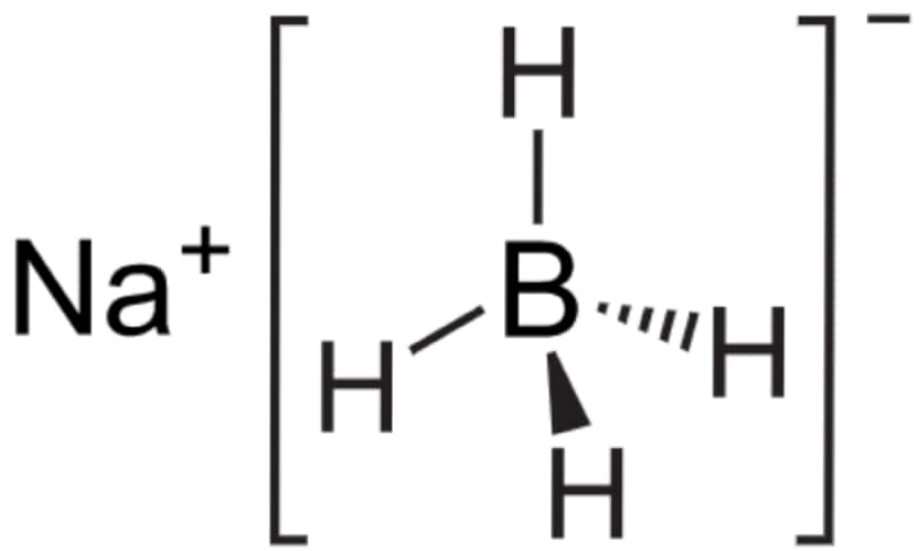
$$Na_2B_4O_7 + 8H_2 + 16Na + 7SiO_2 \rightarrow 7Na_2SiO_3 + 4NaBH_4$$

## Structure of $NaBH_4$

The structure of $NaBH_4$ molecules is illustrated below.




NaBH4 Structure

This salt consists of the $Na^+$ cation and the $BH_4^-$ anion. It can be noted that the $BH_4^-$ ion has a tetrahedral structure. $NaBH_4$ has three stable polymorphs, namely the α, β, and γ polymorphs.

## Physical Properties of $NaBH_4$

- The molar mass of $NaBH_4$ is 37.83 grams per mole.
- This compound does not have any characteristic odour.
- The density of sodium borohydride at STP corresponds to 1.07 grams per cubic centimetre.
- It has a melting point of 673K. However, it tends to undergo decomposition at this temperature.

## Chemical Properties of $NaBH_4$

- Despite being soluble in most protic solvents (like water), this compound slowly reacts with the protic solvent, resulting in the formation of dihydrogen.
- Sodium borohydride generally undergoes decomposition in acidic and aqueous media but not in basic media.
- This compound is a reducing agent and ca

# Uses of Sodium Borohydride

- The primary use of $NaBH_4$ is in the preparation of $Na_2S_2O_4$ (sodium dithionite, which is a bleaching agent for wood pulp) from $SO_2$.
- Aldehydes & ketones can be converted into the corresponding alcohols with the help of this compound.
- Several antibiotics such as thiophenicol, dihydrostreptomycin, and chloramphenicol are produced by employing $NaBH_4$ as a reducing agent.
- It can also be used to reduce foxing in aged documents and books.

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