HYDRIDES

Hydrides are compounds formed by hydrogen with various elements. They can be categorized into three distinct types:

(1) Ionic/Salt Like/Saline Hydrides

Ionic hydrides are the compounds of hydrogen with s-block elements, excluding beryllium and magnesium.

$LiH, NaH, KH, RbH, CsH, CaH_2, SrH_2, BaH_2$

BeH_2, MgH_2 are covalent polymeric hydride.

- Structure of these hydrides are similar to rock salt, so they are also called salt like/saline hydrides.
- Down the group size ↑ Lattice energy↓ stability↓ Melting point↓ Boiling point↓
- On electrolysis of these hydrides, hydrogen is liberated at anode.
- On reaction with water these hydrides will form hydrogen

$$NaH + H_2O \longrightarrow NaOH + H_2$$

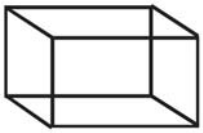
- These hydrides form complex hydrides which are very good reducing agents.

$$4LiH + AlCl_3 \longrightarrow LiAlH_4 + 3LiCl$$

$NaBH_4 \longrightarrow$ Sodium borohydride

$LiAlH_4 \longrightarrow$ Lithium aluminum hydride.

(2) Metallic/Interstitial Hydrides



They are the compounds of d & f-block elements.

These hydrides are referred to as interstitial hydrides because hydrogen is positioned within the interstitial spaces found within the metallic lattice.

- Properties of these hydrides are similar to parent metals, so they are also known as metallic hydrides.
- These hydrides are non. stoichiometric in nature (i.e., having variable composition)

$ZrHx$ $(x = 1.3 - 1.75)$

$TiHx$ $(x = 1.8 - 2)$

- Metals of group 7,8,9 do not form any hydrides so this particular part of periodic table is known as hydride gap.

(3) Covalent/Molecules Hydrides

- They are the compounds of hydrogen with p-block elements CH_4, NH_3, H_2O, HF, etc.
- These hydrides exist as molecules, so they are also known as molecular hydrides. There hydrides are non-conductor of electricity.

Nomenclature – element + Suffix (ane)

$PH_3 \longrightarrow$ Phosphene

$NH_3 \longrightarrow$ Azande

$H_2O \longrightarrow$ Oxirane

These hydrides are again divides into 3 categories.

(a) Electron deficient hydrides:

- They are the hydrides of group 13 elements.
  BH_3, AlH_3, GaH_3 – In these hydrides central element does not have complete octet. i.e., why they are called electron deficient compounds.

(b) Electron precise hydrides – They are the hydrides of group 14 element.

Ex. CH_4, SiH_4, GeH_4

In these type of hydrides central elements has $8e^-$ in their outer most shell.

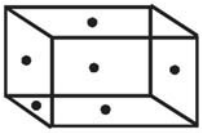
(c) Electron rich hydrides: These are the hydrides of group 15, 16, 17

Ex. $\ddot{N}H_3$, $H_2\ddot{O}$, $H\ddot{F}$: etc.

In these hydrides lone pair are present on central dement which can be given to others. So, they are called electron rich hydrides.

Metallic Or Non-Stoichiometric Hydrides

Mettalic / Interstitial Hydrides



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