use of Boric acid

Boric acid use in manufacturing of optical glass.

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$H_3BO_3 + NaOH$ —— No titration

Boric acid is weak mono basic acid it is not a proton donor acid and it does not provide titration with NaOH because it donot provide a fix titer value.

but in presence of Poly Hydroxy organic acid it act as strong acid and give titration with NaOH.

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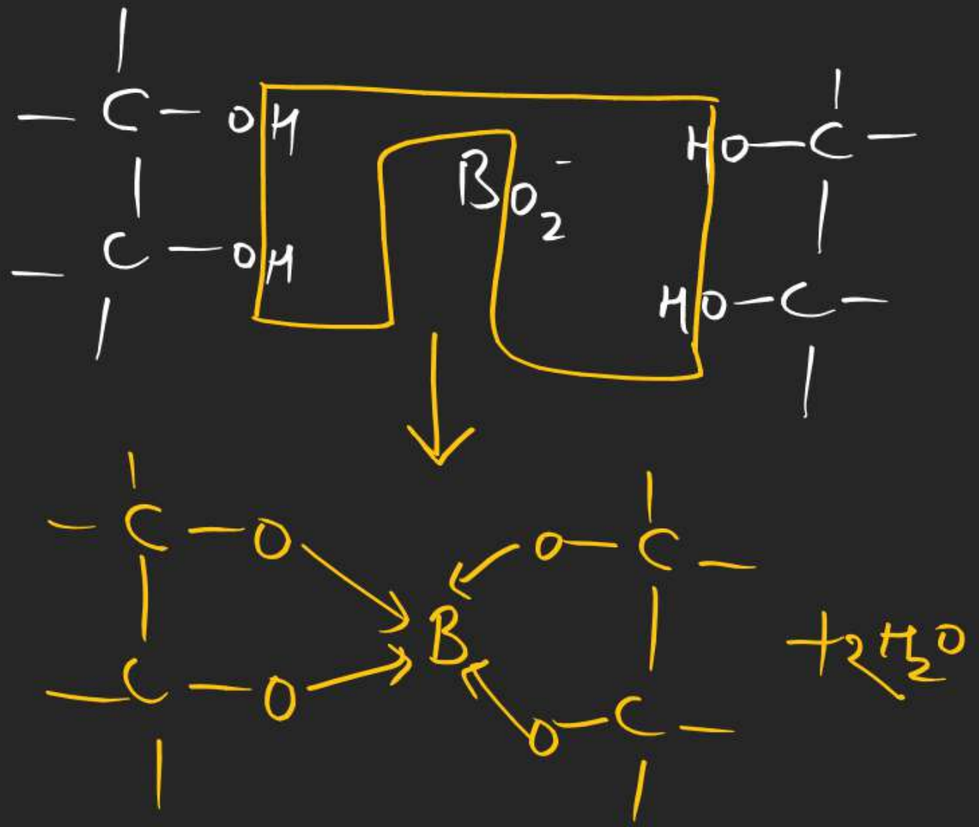
$$B(OH)_3 + H_2O \rightleftharpoons \underbrace{[B(OH)_4]^{\ominus}}_{\text{Borate ion}} + H^+$$

or

$$BO_2^- + 2H_2O$$

(Metaborate ion)



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B_2H_6 (Diborane)

Borane

- Nido borane
  - B_nH_{n+4}
  - (Diborane) B_2H_6
  - B_3H_7
- Arachno borane
  - B_nH_{n+6}
  - B_2H_8 (Diborane-8)
  - B_3H_9

Prep:

Lab:

$$NaBH_4 + I_2 \xrightarrow{\Delta} NaI + B_2H_6$$

Industrial

$$BF_3 + NaH \xrightarrow{\Delta} B_2H_6 + NaF$$

other method

$$LiAlH_4 + BF_3 \longrightarrow B_2H_6 + LiF + AlF_3$$

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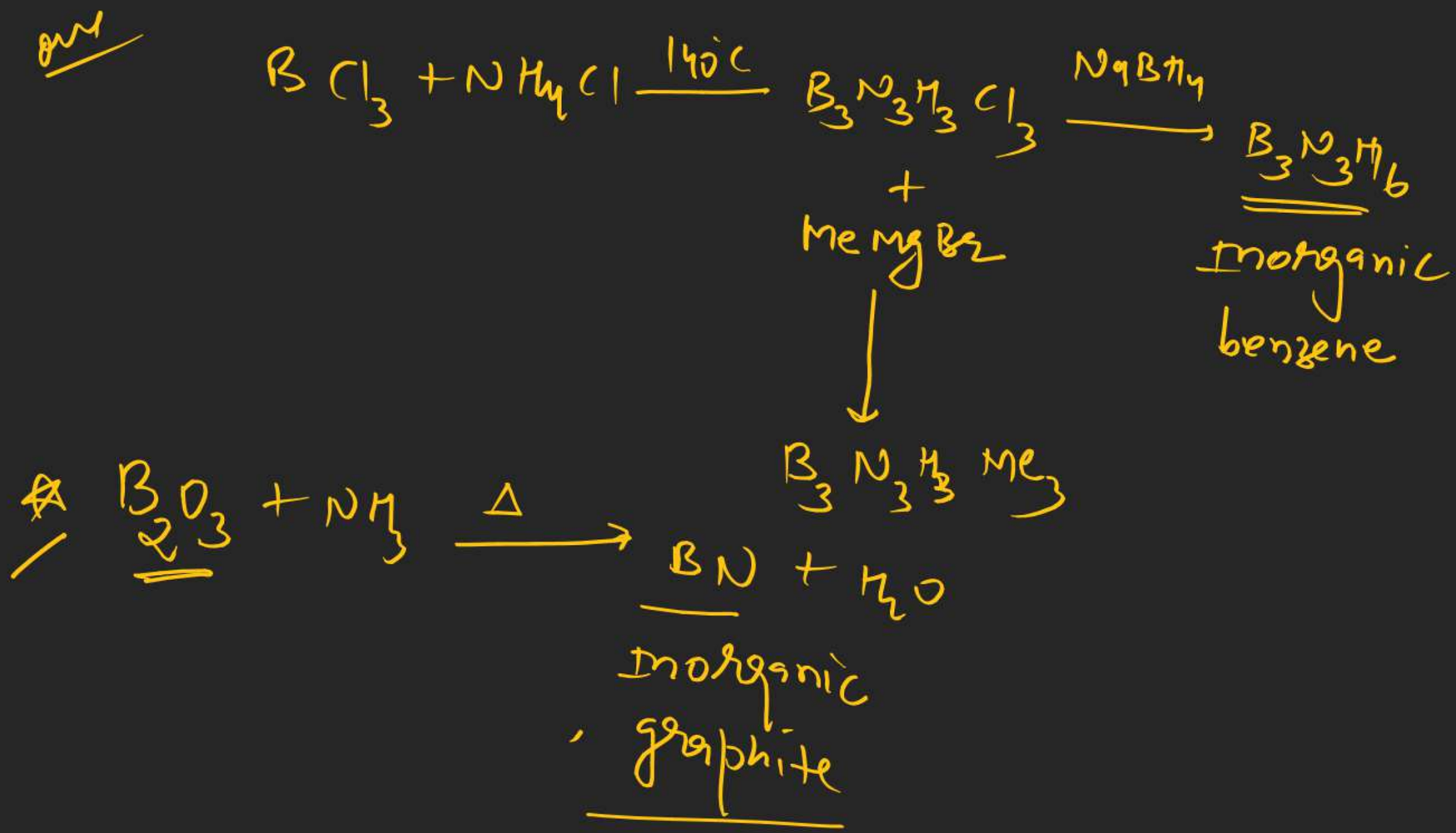
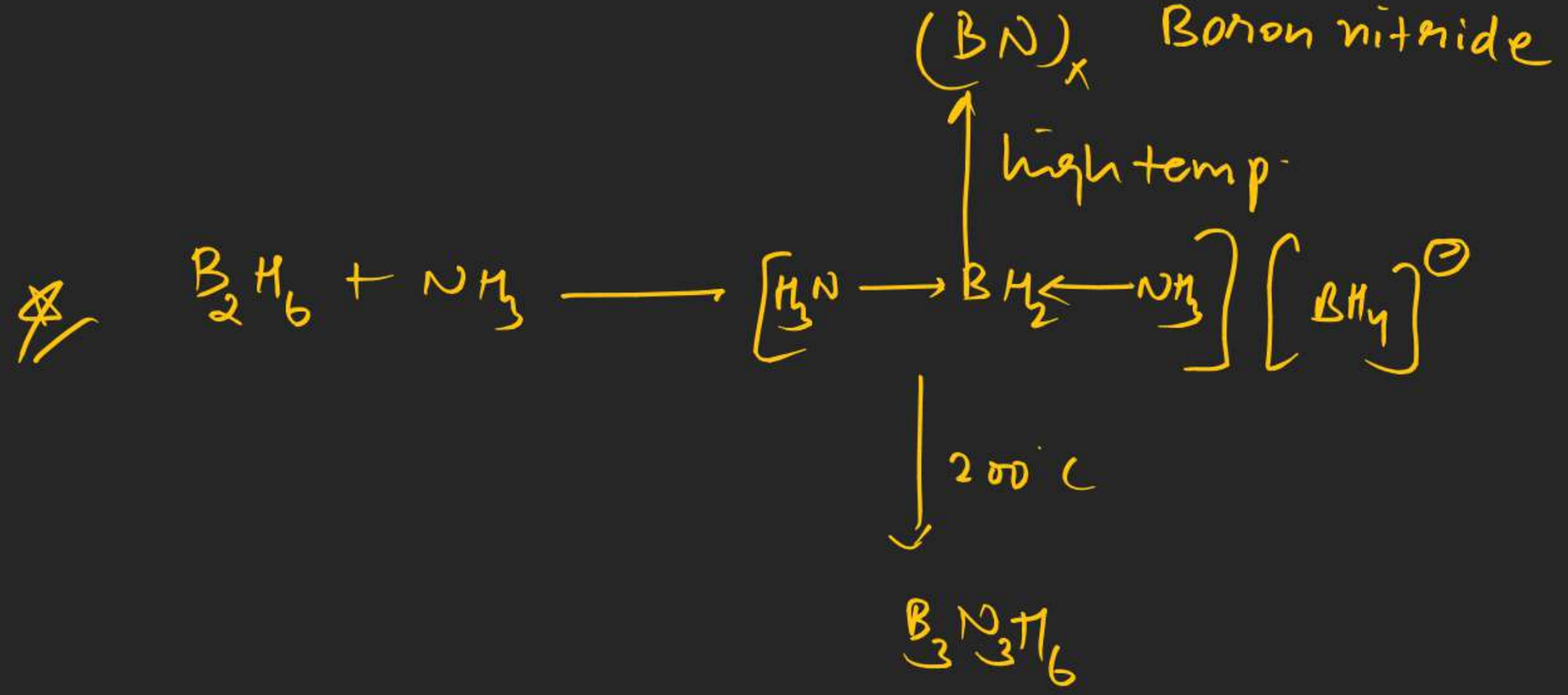
sp^3
tet

3C- $2e^-$ bond = two

$2(-2e^-$ ⇒ four

e^- def. L.A





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Chemical Reaction

$B_2H_6 + O_2 \longrightarrow B_2O_3$

$B_2H_6 + H_2O \longrightarrow H_3BO_3 + H_2$

(Cold enough)

Haloborane

$B_2H_6 + HCl \longrightarrow B_2H_5Cl + H_2$

$B_2H_6 + X_2 \longrightarrow B_2H_5Cl + HX$

Haloborane

$B_2H_6 + NH_3$ (excess) $\xrightarrow{\text{low temp.}} B_2H_6 \cdot 2NH_3 \xrightarrow{200^\circ C} B_3N_3H_6$

$B_2H_6 + NH_3$ (excess) $\xrightarrow{\text{high}} (BN)_x$

Note ⇒ $LiBH_4$ and $NaBH_4$ both are S.R.A in organic Synthesis.

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ALUM

①

$[M(H_2O)_6]^+$

$M_2SO_4 \cdot M'_2(SO_4)_3 \cdot 24H_2O$

or

$M \cdot M'(SO_4)_2 \cdot 12H_2O$

M = Monovalent Cation Na^+ K^+ Rb^+ Cs^+ NH_4^+ Tl^+

M' = Trivalent Cation Sc^{+3} Fe^{+3} Cr Al^{+3}

$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ ⟶ Potash alum

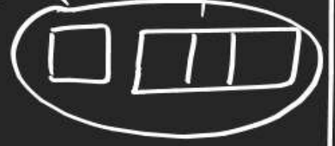
$(NH_4)_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ ⟶ ammonium alum

$K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$ ⟶ Chrome alum

$(NH_4)_2SO_4 \cdot Fe_2(SO_4)_3 \cdot 24H_2O$ ⟶ Ferric alum

and Why Li^+ not use as a monovalent Cation.

$Li^+ = 1s^2\ 2s\ 2p$



C.N = 4

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Note →

if trivalent cation is Al then naming is given by monovalent but trivalent is not Al then naming is given by trivalent

Heating effect

☆

$$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O \xrightarrow[-24H_2O]{\Delta} K_2SO_4 \cdot Al_2(SO_4)_3 \xrightarrow{\Delta} K_2SO_4 + Al_2O_3 + SO_3\uparrow$$

Amorphous powder

use

1. as a Coagulant
2. purification of water
3. Tanning of leather
4. mordant as dye
5. Antiseptic

14th group:

C
Si
Ge
Sn
Pb

Physical prop:

→ all are solid

→ C, Si = nonmetal
Ge = metalloide

→ Sn, Pb ⇒ Soft metal having low m.p

Conf = ns^2np^2

Atomic size ↑ down the group

C < Si < Ge < Sn < Pb

I.E

C > Si > Ge > Pb > Sn

↓

due to poor s.E of 4f Sub shell

Chemical prop:

(1) Oxidation

Carbon also show neg. O.S = −2

C ← +2, +4

Si ← +2, +4

Ge ← +2, +4

Sn ← +2, +4

Pb ← +2, +4

PbI_4 — does not exist

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Reaction with O_2

these element form two type of oxide MO, MO_2

MO = mono oxide ⇒ CO SiO

Carbon mono oxide

SiO ↓ only exist at high temp.

Pb Zn Be Al | Ga Sn (As^{+3}, Ge^{+4})

As_2O_3
Sb_2O_3
V_2O_5

Amphoteric

CO_2, SiO_2
Carbondioxide

C Si Ge ⇒ oxide are acidic

Sn | Pb ⇒ Amphoteric

NO CO H_2O N_2O

these are neutral

Reaction with water

C, Si, Ge ⇒ not affected by water

$$Sn + H_2O \xrightarrow{\Delta} SnO_2 + H_2$$

Note ⇒ Pb is unaffect by water because it form protactive layer of it's oxide.

Reaction with Halogen

MX_2 MX_4

all element direct form these halides with halogen except C

Most of MX_4 halides are covalent

except SnF_4 and PbF_4 both are Ionic

Q. Which is better volatile

$MX_2 < MX_4$

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CCl_4 — no Hydrolysis due to absence of vac. orbital

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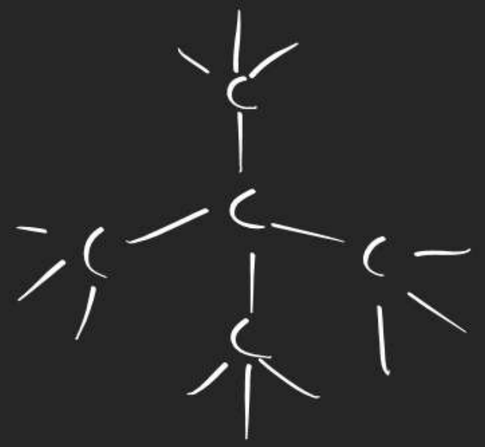
Allotrop of C

- diamond
- graphite
- fullerene

① Dia



sp^3

tet.

Non Conductor

Harder

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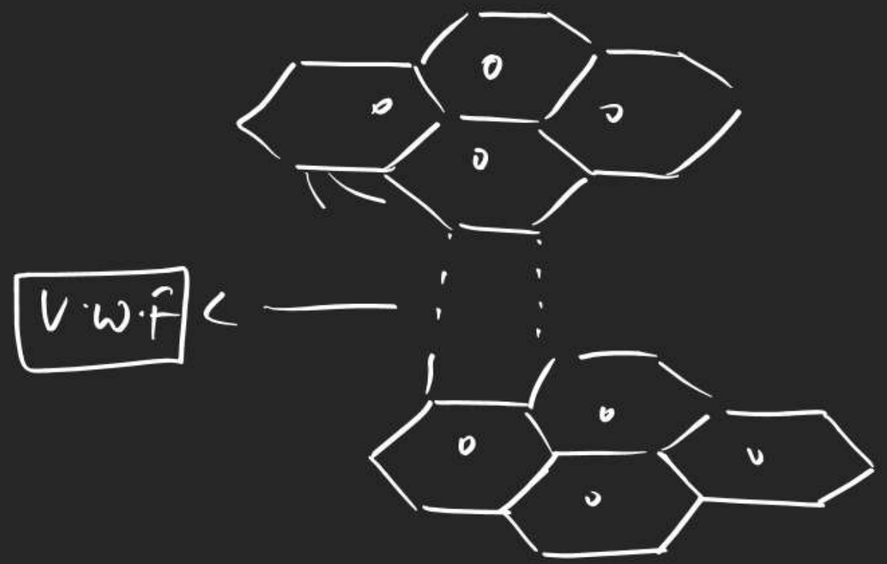
graphite



sp^2

Planar

Conductor

non metallic covalent bond present with in layer of graphite

(T)

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C_{60}

→ sp^2

— aromatic nature

— dangling bond not present

— 20 — Hexagonal Ring

— 12 — Pentagonal Ring (fix in each fullerene

six memb Ring fused with six and five memb. - five memb. Rings fused with only six memb.)

thermodynamic stability

graphite > Dia

order of conduct.

graphite > Dia

due to presence of u.p.e

order of thermal conductance

Dia > graphite

(due to network like st.)