Reagents and Their Application in Organic Reactions (Part I)

B. Sc. (Chem Hons) - Semester VI

Core Course – 14

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Anhydrous Aluminium Chloride

Preparation :

1. By the reduction chlorination of bauxite ore –

$$Al_2O_3 + 3C \xrightarrow{\text{Heat}} 2Al + 3CO$$

$$2Al + 3Cl_2 \longrightarrow 2AlCl_3$$

Anhy. $AlCl_3$

2. By direct combination –

$$2Al + 3Cl_2 \xrightarrow{\text{Heat}} 2AlCl_3$$

Anhy. $AlCl_3$

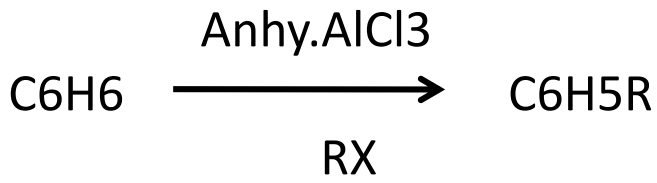
3. From $FeCl_3$ –

$$FeCl_3 + Al \xrightarrow[\Delta\ /5\ \text{hours}]{450\ \text{deg C}} AlCl_3 + Fe$$

Uses

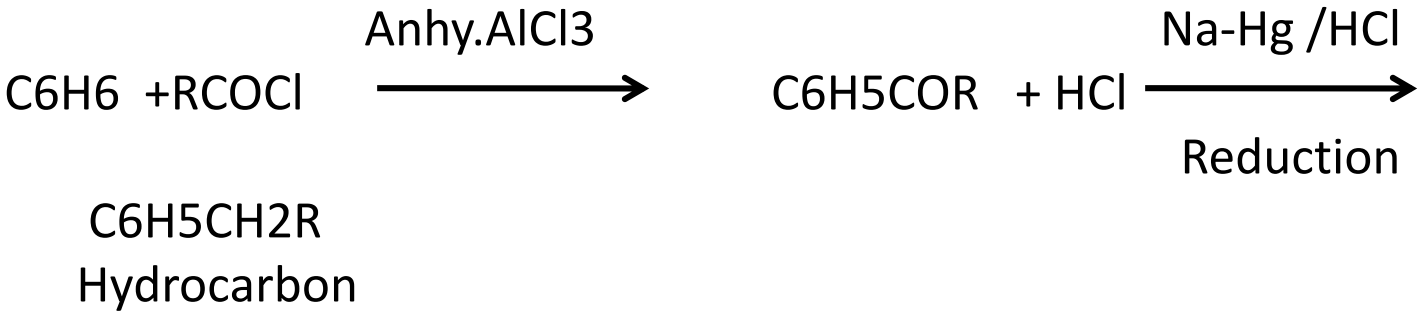
Anhy. AlCl3 has an electron deficient atom hence functions as Lewis acid. It initiates the reaction by accepting halogen or electron pair and furnishing potential carbocation.

a) For the preparation of alkyl substituted benzene

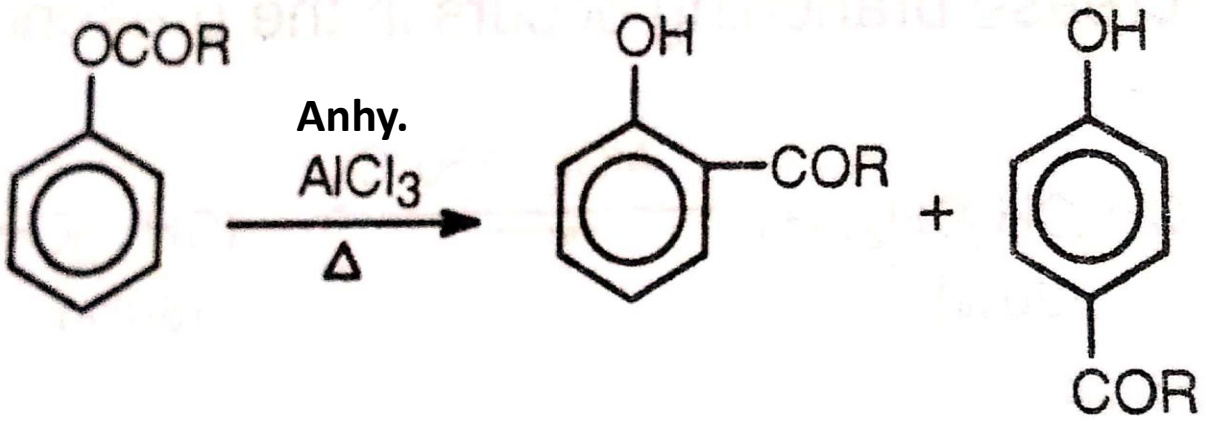


b) For the preparation of ketone

c) For the preparation of hydrocarbon

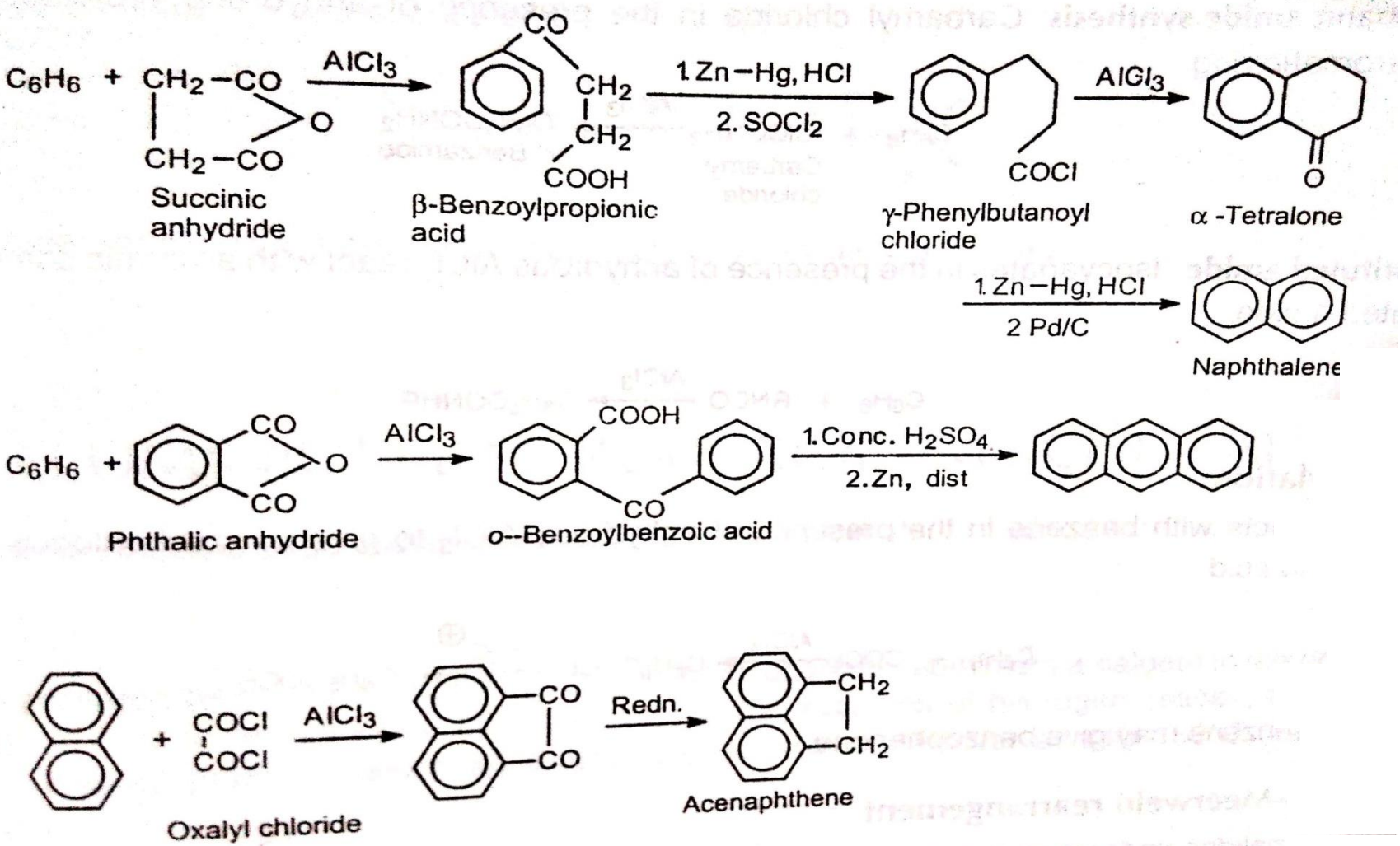


d) For the preparation of o- and p- hydroxy ketone –Anhy.AlCl3 is also used as a catalyst in the Fries rearrangement to convert phenyl ester into o- and p- hydroxy ketone .



o-hydroxyketone **p-hydroxyketone**

e) For the synthesis of poly nuclear hydrocarbon



f) For the synthesis of aromatic aldehyde from benzene

$$C_6H_6 + CO + HCl \xrightarrow{\text{Anhy.AlCl}_3} C_6H_5CHO + HCl$$

Benzaldehyde

$$HCl + HCN \xrightarrow{\text{Anhy.AlCl}_3} ClCH = NH$$

$$C_6H_6 + ClCH = NH \xrightarrow{\text{Anhy.AlCl}_3} C_6H_5CH=NH + HCl$$

$$C_6H_5CH=NH \xrightarrow{H_2O} C_6H_5CHO + NH_3$$

g) For the synthesis of halogen derivative

$$3C_6H_6 + CCl_4 \xrightarrow{\text{Anhy.AlCl}_3} (C_6H_5)C\text{-}Cl + 3HCl$$

Triphenylmethylchloride

(…… to be continued in next Cass lecture , Organic Reagents - Part II).

THANK YOU