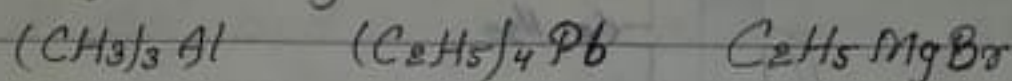


ORGANOMETALLIC COMPOUNDS

Organometallic compounds may be defined as substances having C-metal bond. A large number of metals i.e. Li, Mg, Al, Pb, Sn, Zn, Hg, Cd etc. formed fairly stable compounds. A few stable organo metallic compds. are given below:



Grignard reagent is the type of organometallic compounds.

GRIGNARD REAGENT

* Alkyl magnesium halide is called grignard reagent.

In 1899 Barbier used a mixture of alkyl halide and Mg in ether to prepare a large no. of organic compds. Later on 1900 Grignard student of Barbier prepared a compound alkyl magnesium halide which is known as grignard reagent. After the name of discovered the general formula of g.r. is $RMgX$ where R is univalent hydrocarbon radical like $-CH_3$, $-C_2H_5$, $-C_6H_5$, $C_6H_5CH_2$, $CH_2=CH-CH_2OH$ and X is the any halogen group like Cl, Br, I.

* Preparation:

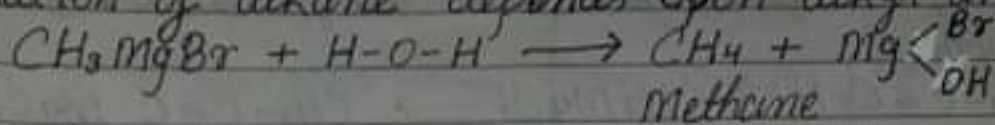
Grignard reagent are prepared by the action of Mg-metal on alkyl halide in presence of ether.

Dry and clear Mg turnings are taken in dry and pure ether in a round bottle flask. Water condenser fitted in round bottle flask with the help of cork water condenser carry a $CaCl_2$ in guard tube at the top. Weight of ether taken about ten times that of Mg ($1g\text{m RX} \rightarrow 1g\text{m Mg}$). The flask is burn and few crystals of iodine or

* Chemical properties:

(1) Reaction with water: Grignard reagent hydrolysed with water and form corresponding alkane.

Formation of alkane depends upon alkyl and g.r.

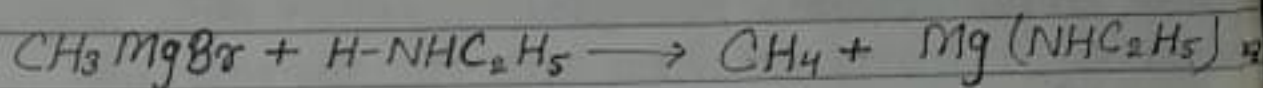


Methane

Alcohol and ammonia also form alkane with g.r.



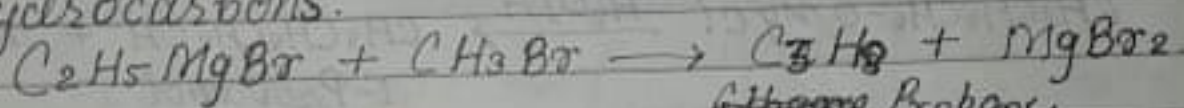
Ethane



Methane

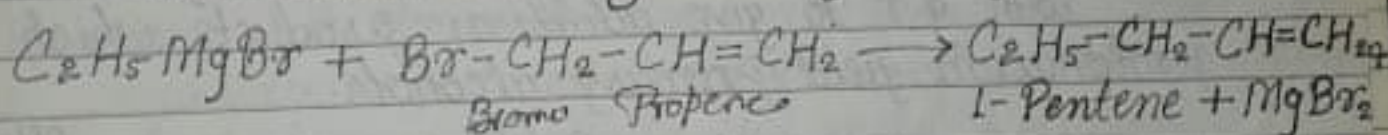
Note: - These H-atom attached with alkyl group of g.r. which is associated with more electro-negative atom like oxygen and nitrogen.

(2) Reaction with Alkyl halide: Alkyl halide reacts with grignard reagent to give higher hydrocarbons.



~~Ethane~~ Propane

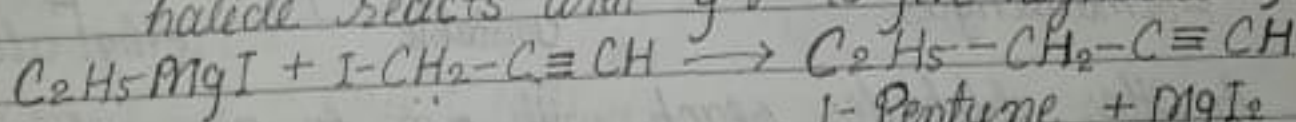
(3) Reaction with Alkenyl halide: When alkenyl halide reacts with alkyl g.r. to give higher alkene.



Bromo Propene

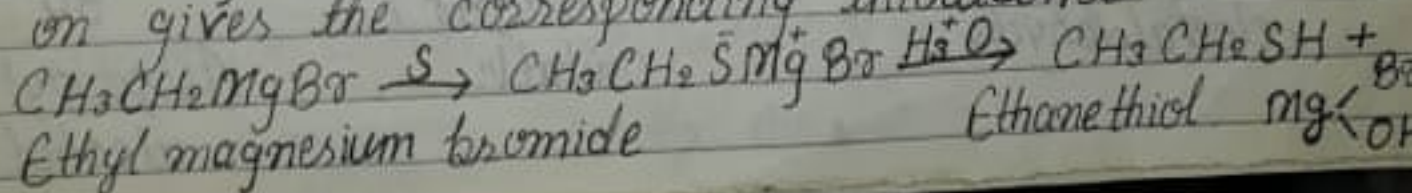
1-Pentene

(4) Reaction with Alkynyl halide: When alkynyl halide reacts with g.r. to give higher alkyne.



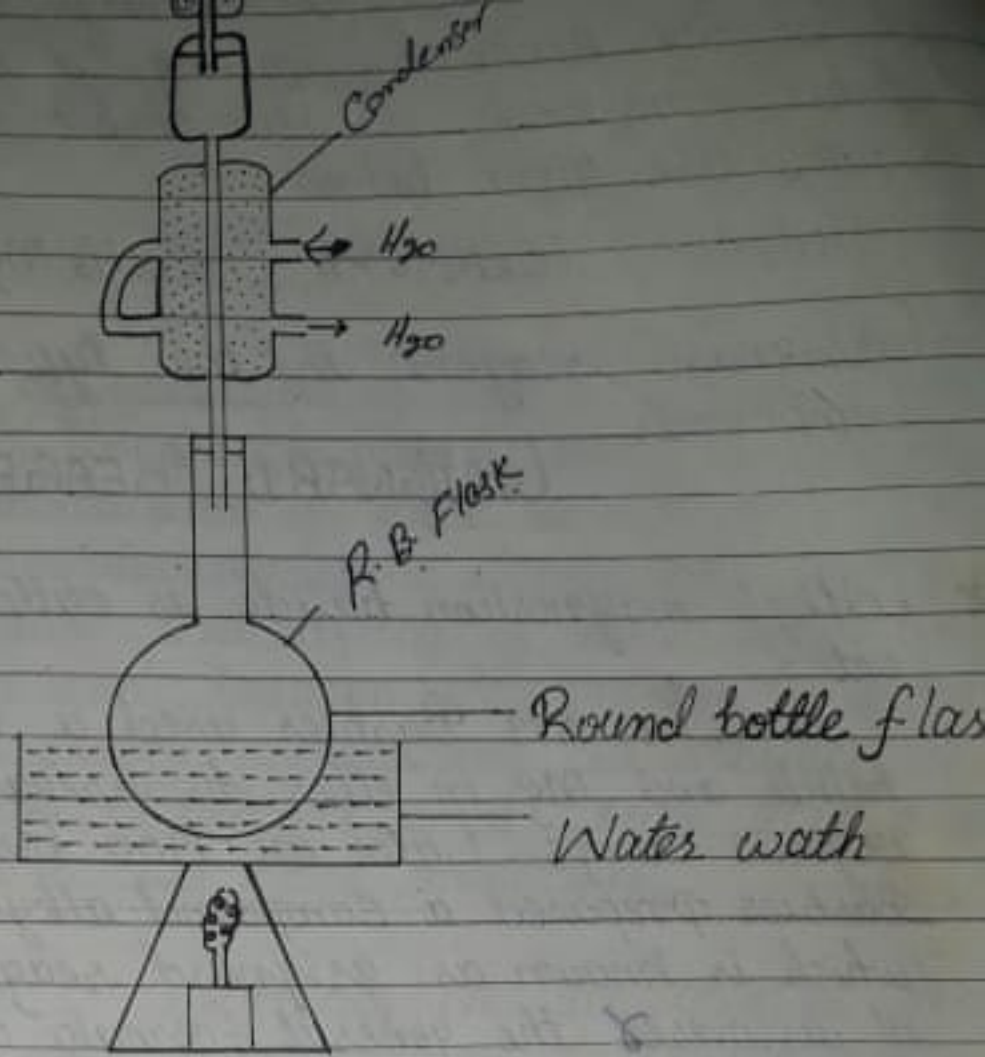
1-Pentyne

(5) Reaction with Sulfur: When sulfur reacts with g.r. to give a product which on protonation gives the corresponding thioalcohol.



Ethyl magnesium bromide

Ethanethiol

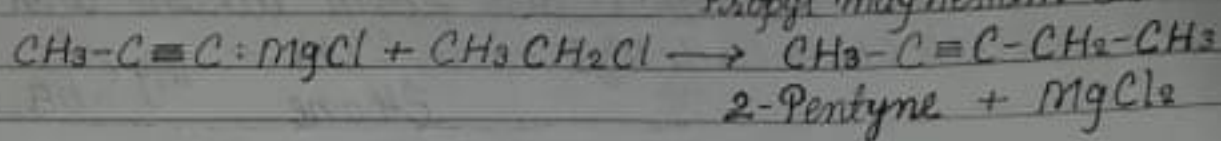
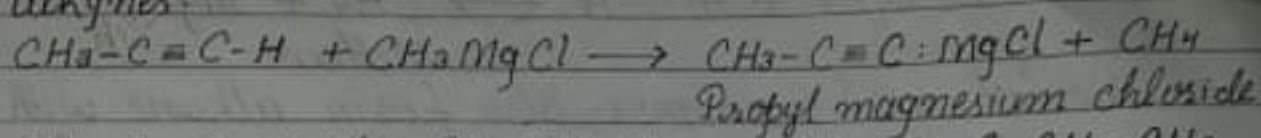


few drops of ethyl bromide are added to catalyze the reaction. After the alkyl halide is mixed the flask is heated on water bath till Mg residue. After completion of reaction solution becomes Grignard reagent. Grignard reagent is never isolated in solid state for synthetic purpose.

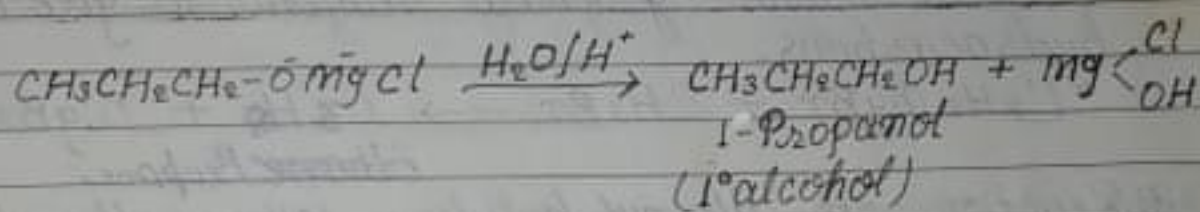
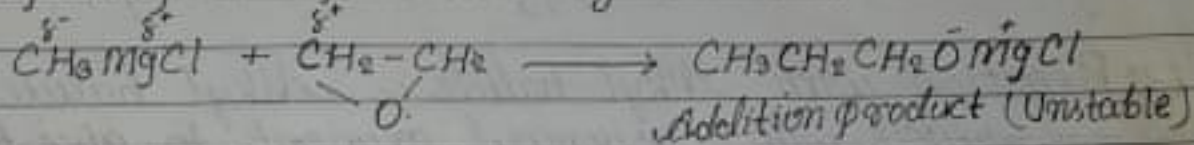
★ Physical Properties :

- (1) It is colorless, hygroscopic solid.
- (2) Never obtained in solid state for chemical reaction.
- (3) They are fairly stable in air.
- (4) Grignard reagents are highly reactive.
- (5) $RMgBr$ and $RMgI$ in general reacts more readily than the corresponding chlorides.

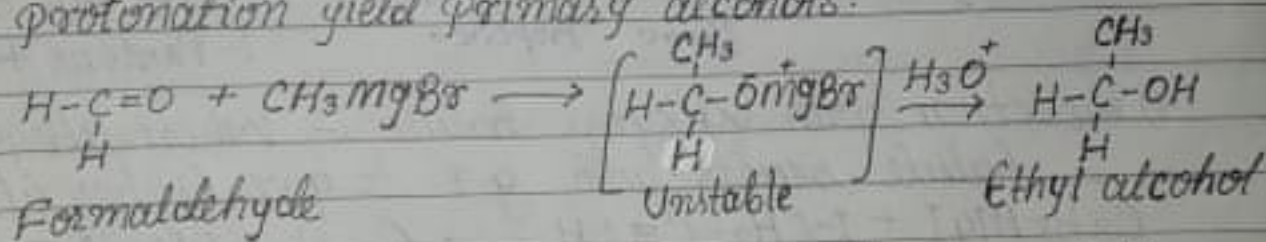
(6) Reaction with Alkynes - 1. Alkyne reacts with to form alkynyl magnesium halide. Which on subsequent treatment with alkyl halides form higher alkynes.



(7) Reaction with Epoxides (Oxiranes) :- Grignard reagents are powerful nucleophiles and can react with δ^+ carbons of epoxides. The reaction results in ring opening and formation of an alcohol



(8) Reaction with Aldehydes :- (a) Formaldehyde reacts with g.r. to give addition products which on protonation yield primary alcohols.



(b) Other aldehydes react with g.r. to give addition product which on protonation yield sec. alcohols.

