

B.SC. 5TH SEMESTER (PAPER 7; UNIT 1)

Organometallic Compounds-1

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- ✓ Introduction
- ✓ Activity of organometallic compounds
- ✓ Organomagnesium compounds
- ✓ Preparation & structure

By-

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Note: For Assignments and any other query, download [Google classroom app](#) and join the class by entering the Class code: aylid27

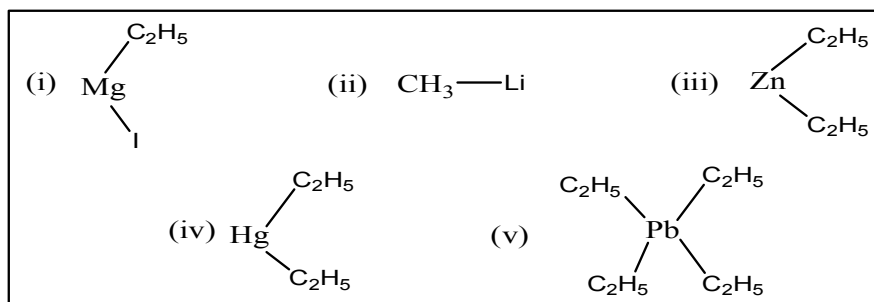
References:

1. Modern methods of organic synthesis; Fourth Edition; W. Carruthers & I. Coldhem.
2. Organic Chemistry; Volume one; The Fundamental Principles; I. L. Finar.
3. Undergraduate, Organic Chemistry; Volume III; J.Singh & L.D.S. Yadav.

INTRODUCTION

Organometallic compounds are those organic compounds in which one or more hydrocarbons is/are directly joined with metallic atom. In other word we can say all organometallic compounds must have **C-M** bond.

e.g.



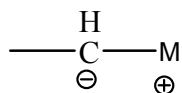
Question 1: Which of the following are not organometallic compounds?

- | | |
|---|--|
| (i) CH_3MgBr | (vi) $\text{C}_2\text{H}_5\text{ONa}$ |
| (ii) $(\text{C}_2\text{H}_5)_3\text{Al}$ | (vii) $\text{C}_2\text{H}_5\text{Li}$ |
| (iii) $\text{Ca} \begin{array}{l} \diagup \text{OOCCH}_3 \\ \diagdown \text{OOCCH}_3 \end{array}$ | (viii) $(\text{C}_2\text{H}_5)_2\text{Zn}$ |
| (iv) $(\text{C}_2\text{H}_5)_4\text{Pb}$ | (ix) $\text{C}_3\text{H}_7\text{MgBr}$ |
| (v) CaC_2O_4 | (x) $(\text{C}_2\text{H}_5)_2\text{Hg}$ |

Activity of organometallic compounds

Activity of organometallic compounds depends on the electropositive character of metal. More is the electropositive character of metal, and then more will be the activity of these organometallic compounds (i.e. more will be the ionic character between carbon metal bond). In this compounds carbon is bonded with electropositive metal hence it bears partial negative charge and metal bears

positive charge. Due to this action organic part of organometallic compound always behave as nucleophile as well as base.



Note: Electropositive character is the tendency of metals to form cation by removing its electron. Those metals which form cation easily are good electropositive metal.

Here I give a concise summary of electrochemical series and relate it with activity of metals.

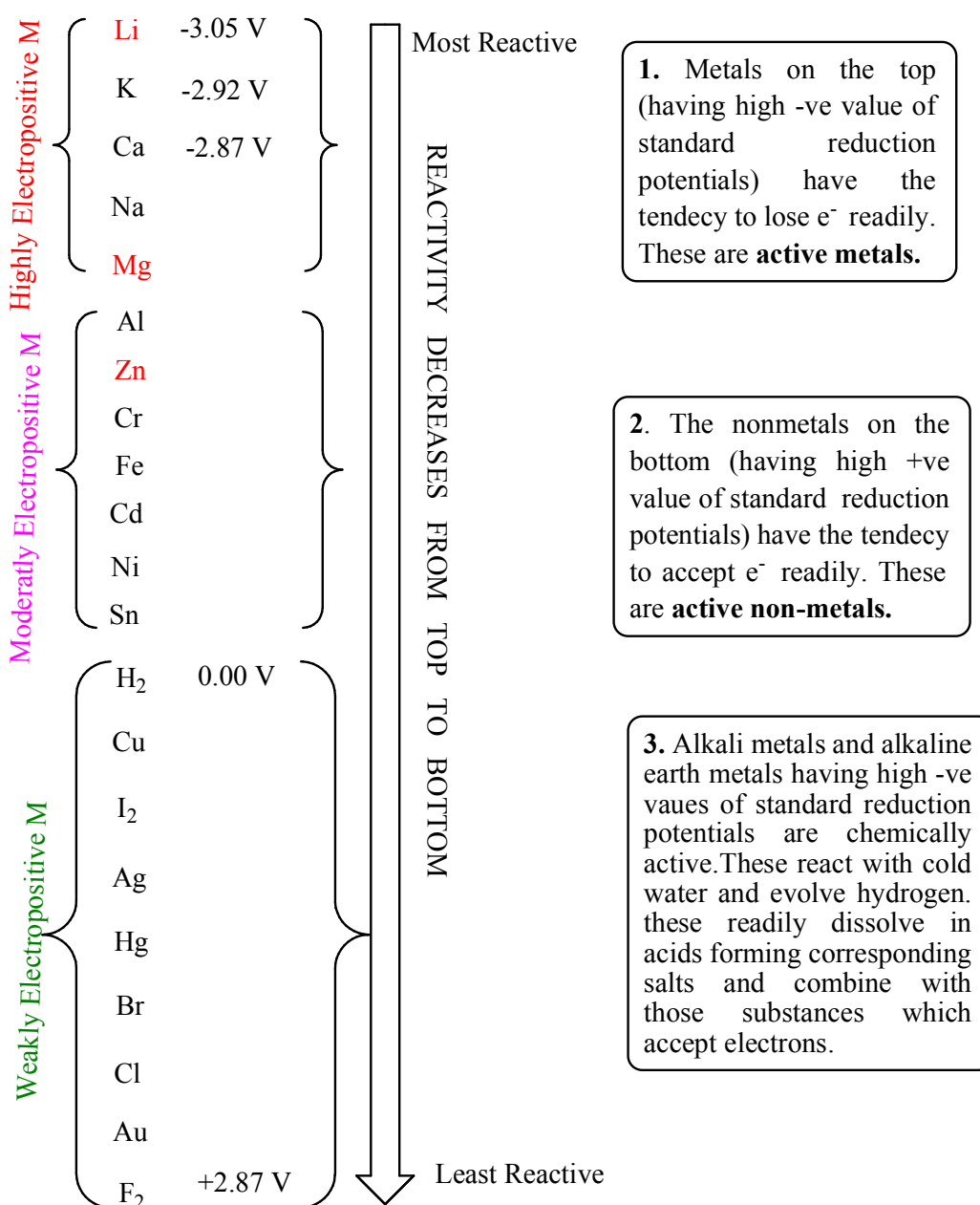
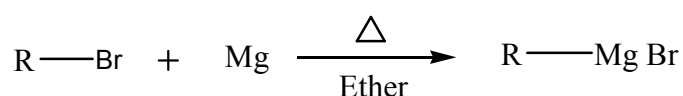


Figure 1: Electrochemical series

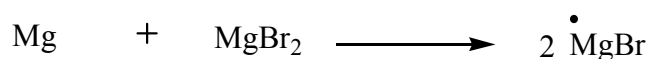
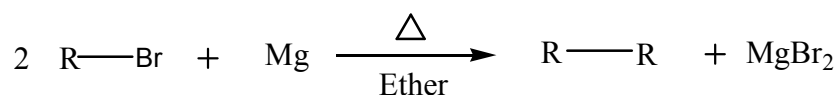
ORGANOMAGNESIUM COMPOUNDS

All those organometallic compounds in which metal is Mg are known as organo-magnesium compounds. e.g. R-MgX

Alkyl magnesium halide or Grignard reagents is introduced by French chemist Victor Grignard in 1900. It is generally prepared by reaction between magnesium and alkyl halide in dry, alcohol free ether solvent.



Mechanism



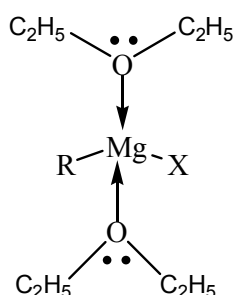
Reaction begins with the formation of magnesium halide. This MgX_2 react with Mg to give MgX radical. Which further combine with alkyl free radical to give alkyl magnesium halide as product.

STRUCURE

Actual general formula: $\text{R-MgX} \cdot 2\text{Et}_2\text{O}$

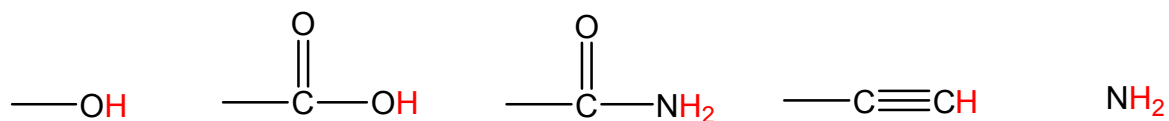
But it is represented as: R-MgX

Grignard reagents are soluble in ether solvent where magnesium is tetrahedrally coordinated with two solvent molecules.



Properties

1. It is colorless unevaporative solid, but in laboratory we used its ethereal solution.
2. Grignard reagent is very reactive and undergo reaction with those compound which have acidic hydrogens. Hence it should be take care that substrate does not contain group like :



(All H are acidic hydrogen)

3. Magnesium has very high affinity with oxygen and other electronegative atoms.