

CHEMISTRY STUDY MATERIALS FOR CLASS 12

(NCERT BASED NOTES OF CHAPTER - 09)

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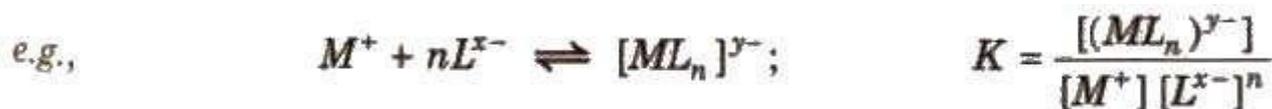
Co-ordination Compounds

Limitations of CFT

1. It does not consider the formation of π bonding in complexes.
2. It is also unable to account satisfactorily for the relative strengths of ligands
e.g., it does not explain why H_2O is stronger ligand than OH^- .
3. It gives no account of the partly covalent nature of metal-metal bonds.

Stability of Coordination Compounds

The stability of complex in solution refers to the degree of association between the two species involved in the state of equilibrium. It is expressed as stability constant (K).



The factors on which stability of the complex depends:

- (i) Charge on the central metal atom** As the magnitude of charge on metal atom increases, stability of the complex increases.
- (ii) Nature of metal ion** The stability order is $3d < 4d < 5d$ series.
- (iii) Basic nature of ligands** Strong field ligands form stable complex.

The instability constant or the dissociation constant of compounds is defined as the reciprocal of the formation or stability Constant.

Applications of Coordination Compounds

1. They are used in much qualitative and quantitative analysis.
2. Hardness of water is estimated by simple titration with Na_2EDTA .
3. Purification of metals can be achieved through formation and subsequent decomposition of their coordination compounds.

4. They have great importance in biological systems.
5. They are used as catalyst for many industrial processes.
6. In medicinal chemistry, there is a growing interest of chelating therapy.

Organometallic Compounds

(WE HAVE READ ORGANOMETALLIC COMPOUNDS QUANTITATIVELY IN P-BLOCK ELEMENTS)

They contain one or more metal-carbon bond in their molecules.

They are of the following types:

1. Sigma (σ) bonded compounds

Metal-carbon bond is sigma bond, e.g., $(C_2H_5)_4Pb$, $Zn(C_2H_5)_2$, $R-Mg-X$, etc.

2. Pi (π) bonded compounds

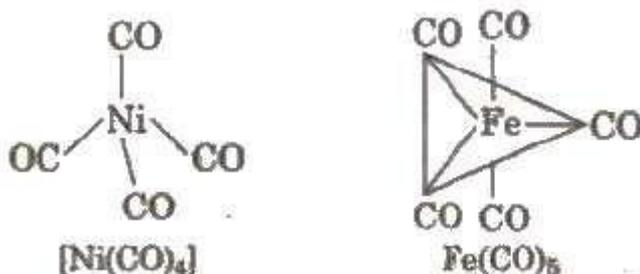
In which molecules/ions containing π bonds act as a ligand. e.g., Ferrocene, Dibenzene chromium and Zeise's salt.

Zeise's salts is $K[PtCl_3(\eta^2-C_2H_4)]$ In which ethylene acts as a ligand which do not have a lone pair of electron.

In ferrocene, $Fe(\eta^5-C_5H_5)_2$ represents the number of carbon atoms with which metal ion is directly attached.

3. σ and π bonded compounds

Metal carbonyls are their examples. Metal-carbon bond of metal carbonyls have both σ and π – bond character. They have CO molecule as ligand, e.g.,



Wilkinson's catalyst ($Rh(PPh_3)_3Cl$) is used as homogeneous catalyst in the hydrogenation of alkenes. Zeigler-Natta catalyst

$[TiCl_4 + (C_2H_5)_3Al]$ acts as heterogeneous catalyst in the polymerization of ethylene.
