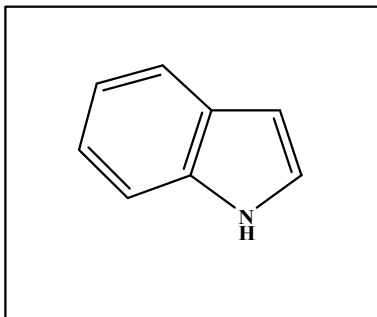


CHAPTER 2

LITERATURE

REVIEW

Indole is an aromatic heterocyclic organic compound. It has a bicyclic structure, consisting of a six-membered benzene ring fused to a five-membered nitrogen-containing pyrrole ring. The participation of the nitrogen lone electron pair in the aromatic ring means that indole is not a base, and it does not behave like a simple amine.



Structure of indole

Indole-3-acetic acid, also known as IAA, is a member of the group of phytohormones called auxins. IAA is generally considered to be the most important native auxin. The first study of indole was in the 1940s, led to the development of the phenoxy herbicides 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid. They are metabolically and environmentally more stable analogs of IAA. However, when sprayed on broad-leaf dicot plants, they induce rapid, uncontrolled growth, eventually killing them. First introduced in 1946, these herbicides were in widespread use in agriculture by the middle of the 1950s (Bhatia S.C *et al.*, 1981).

Electrochemistry

Over the past couple of decades, potential sweep technique, such as cyclic voltammetry, have been applied to an ever increasing range system and at the same time the

mathematical description of these technique has been developed sufficiently to enable kinetic parameters to be determined for a wide variety of mechanisms. However, in the area of preliminary mechanistic investigations that sweep techniques, in particular cyclic voltammetry is probably most useful. An '*electrochemical spectrum*' indicating the potentials at which processes occur can be rapidly obtained, which from the sweep rate dependence the involvement of coupled homogeneous reactions is readily identified and other complications can be recognized.

Recently, there has been a growing amount of interest towards electrochemistry. It has provided very interesting and versatile means for the selective reduction or oxidation of organic compounds. Electrochemical active compounds of some first row transition metal complexes containing Schiff base ligands have been reported in many literatures (A. L Gerber *et al.*, 1992). However, much of the work are limited to non-electrochemical researches such as those done on anti-microbial and anti-cancer, whereas in electrochemistry, only cyclic voltammetry was done merely to prove that they are electrochemically active compounds. Many Schiff base containing ligands among the first row transition metal compounds that were synthesized showed reduction and oxidation waves and peaks, thus meaning that electro-reductive or electro-oxidative synthesis is possible to be conducted on these compounds.

Cyclic voltammetry is an electrochemical technique which enables scientists to test and discover the ability of a material to intercalate ion and hence suggest new materials as electrodes in batteries (Basirun *et al.*, 2000). Electrochemical behaviour of

the Schiff base ligands and their complexes were investigated by cyclic voltammetry technique. In 1993, (Garcia-Deibe *et al.*,1993) studied cyclic voltammetry of some manganese (III) complexes. The voltammograms for most of the Schiff base complexes showed two oxidation and two reduction peaks, indicating two redox processes, presumably Mn (II) / Mn (III) and Mn (III) / Mn (IV) couples. None of the complexes showed completely reversible behaviour but quasi-reversible behaviour was observed. ($\Delta E_p = 0.11-0.32V$).

Recently, tridentate Schiff base complexes of Ru (III) containing ONS/ONO donor atoms were prepared and characterized by T. Thangadurai and K. Natarajan. The cyclic voltammetry studies showed that all the complexes are reversible oxidation (Ru(IV)/ Ru (III) wave with ΔE_p ranging from 60-100mV indicating one electron transfer process. Electrochemistry study on Ru(II) complexes containing phosphorus or sulphur donor atoms carried out recently by Nakajima *et al.*, 2000. Different redox behaviour (quasi-reversible, irreversible and reversible) were reported.

Biological activity of indolehydrazones

The functions of a metal ion in natural biological system depend on the structural arrangement of the coordination sphere and the electronic environment of the ligands. Schiff base ligands have gained importance because of physiological and pharmacological activities associated with them and have been of interest to many scientists for many years (Hapipah *et al.*, 2003). They constitute an interesting class of

chelating agents capable of coordinating to metal ion and give complexes which can be utilized selectively as drugs as well as serve as model for biological system (Cotton *et al.*, 1999).

Moreover, potential applications in catalysis and enzymatic reactions are among the reason for the development of the coordination chemistry of such complexes (J. Costamagna *et al.*, 1992). Some of them show anti-fungal activity and are also good chelating agent. Chelating increases an anti-microbial property as is evident from a large number of compounds studied by Gardin *et al.*, 2003.

The field of bioinorganic chemistry which deals with the study of role of metal complexes in biological systems, has opened a new horizon for scientific research in coordination compounds. The coordination chemistry of metallodrugs is strongly dependent on understanding the thermodynamics and kinetics of the reactions of metal complexes under physiological relevant conditions. The pharmacological activities of metal compounds depend on the metal ion, its ligands and the structure of the compounds. These factors are responsible for reaching them at the proper target site in the body.

Bismuth compounds as in previous work are most commonly used for treating gastrointestinal disorder. The effectiveness of bismuth has been attributed to its bactericidal action against the gram-negative bacterium *Helicobacter pylori*, the bacterium associated with the mucus layer of ulcers (A. L Gerber *et al.*, 1992). The roles

of colloidal bismuth citrate (CBS) and bismuth subsalicylate (BSS) in gastric and duodenal ulcer therapy and the eradication of *Helicobacter pylori* have been studied extensively (Hapipah *et al.*, 2003).