CONCLUSIONS

The complexing ability of Schiff bases also termed as imines (>C=N) is well established by several authors. This is due to the presence of lone pair of electrons in the nitrogen atom and the general electron donating character of the double bond. The basic strength of the >C=N group alone is not sufficient to form highly stable complexes. If a functional group with a replaceable hydrogen atom, preferably a hydroxyl group, closer to the >C=N group is present, more stable metal complexes will be formed by chelation with five or six membered ring.

Literature survey reveals that there are numerous references to the existence of Schiff bases, structures they act as monodentate, bidentate, tridentate metal complexes and so on. Surveys have also revealed that the imine compounds not only have very good complexing ability towards metal ions but also serve innumerable purposes of application in various fields like pharmacy, medicine, agriculture, textiles, paints and pigments, industries, photography, catalysis and polymer technology.

Schiff base complexes of various transition metals have been investigated for their coordinating capability, pharmaceutical and biological activities. These complexes are used as catalysts for water photolysis or reduction of oxygen at a modified carbon cathode. Some compounds have been used for catalytic hydrogenation of unsaturated hydrocarbons. Schiff base have also been used for analytical purposes in the determination of metal ions, and some Schiff base derivatives have been used in the extraction of metal solvents. The applications of such complexes depend to a large extent on their molecular structure. The present work provides a new series of metal complexes of Cu(II), La(III), Co(II), Ni(II), Mn(II), Mo(VI) and Pd(II) with Schiff base ligands derived from p-Toluic Hydrazide and different aldehydes and ketons. These complexes were characterized by elemental analysis, IR, NMR, UV, ESR spectroscopy, VSM, TG-DTA, Conductivity measurements and Powder X-RD to determine the mode of bonding and geometry biological activities of the metal complexes were also studied.

In view of the above important applications the author was prone to prepare new Schiff bases and their metal solid complexes with the hope that the new Schiff base or its metal complexes may find a spectacular place in any of the fields cited above.
When a new Schiff base metal complex is reported, it is in practice to carry out in detail studies of solid metal complexes. Solid state chemistry in fact gives important conclusions like geometry, metal-ligand bond strength, oxidation state, electronic configuration, structure and stability of the complexes. Solid metal complexes of transition metal ions have been prepared and characterized by elemental analysis. In order to ascertain the nature of bonding, oxidation state, stability and structure, various studies like IR, NMR, UV, ESR spectroscopy, VSM, TG-DTA, Conductometric analysis and Powder X-RD have been carried out and confined only on elucidation obtained of structure w.r.t. Schiff base ligands. In addition, the author has also investigated antibacterial activities of the metal complexes by using different bacteria it is more active towards microbial activities compared to other Schiff base metal complexes (Chapter-IX).

Chapter I reveals that physico-chemical and various spectral techniques like IR, NMR, UV, ESR, VSM, TG-DTA, Conductometric Studies and Powder X-RD analysis have been using for understood.

Chapter II covered all fundamentals of Schiff base ligands and their metal complexes and scope of the study present work.

The author has prepared new schiff base metal complexes using p-Toulic Hydrazide and different aldehydes and ketones namely Cu(II) and La(III) complexes of OHBPPTH, OHBAPTH, VPTH, 2TMBAPTH and 3TMBAPTH, further the author synthesized Cu, La, Co, Ni, Mn, Mo and Pd complexes of DHBPPPTH (chapter-III).

Infrared studies provided the way to understand the behaviour of the ligand and nature of bonding with various metal ions by analysing the IR graphs (Chapter-IV & VIII). By this it is understood that the phenolic oxygen atom, nitrogen atom of the azomethine functional group (>C=N) participate to form metal chelate ring. Further it is seen that water is also coordinated in majority of the metal complexes were studied.

$^1$H NMR spectroscopy proved the adjacent nature and the presence of a number of protons in a particular environment for various ligands and their metal complexes (Chapter-IV & VIII). The singlets observed in the NMR spectra of ligands due the presence of H-C=N proton showed downfield shift in their respective complexes. It indicates the shielding of azomethine proton on coordination through nitrogen atom of the azomethine group.
The analysis of UV spectr and $\lambda_{\text{max}}$ of different ligands and their metal complexes helped to identify the stable nature of the complexes owing to charge transfer. This in turn indicated that the complexes were non electrolytic in nature (Chapter-V & VIII).

ESR spectra of Cu and La complexes for OHBPPTH, OHBAPTH, VPTH, 2TMBAPTH, 3TMBAPTH and DHBPPTH azomethines and provides bonding nature and geometry of the complexes. ESR data reveals that the covalent nature of metal-ligand bond in complexes. From the trend of g values the unpaired electron is localized in $dx^2-y^2$ or $dz^2$ and dxy orbital for Cu(II) and La(III) complexes respectively. It was observed that the g value was less than 2.30 for Cu(II) and La(III) complexes which in turn indicated covalent character of the M-O and M-N bonds for metal complexes. It was noted that the $\alpha^2$ and P-values obtained for the present complexes lay in between 0.0152-0.0192 cm$^{-1}$ and it was indicative of the bonding of copper ions and Lanthanum ion to oxygen and nitrogen donor atoms. The shape of ESR lines, ESR data suggested an octahedral geometry for Cu and La complexes. (Chapter-V & VIII).

Vibrational spin magnetometer by define magnetic susceptibility values are given in Chapter-VI &VIII.

By assigning the final structure of metal complexes, thermal studies have helped immensely. From the thermograms, the presences of number of water molecules in and out side the coordination sphere were easily predicated. Fromation of 1:2 complexes by Cu(II), La(III), Co(II), Ni(II), Mn(II), Mo(VI) and Pd(II) have been understood from weight loss of the ligand from the thermograms for all azomethine metal complexes (Chapter –VI & VIII). From the thermal decomposition of the complexes the following approximiate stability orders for various metal ions have been established. TG-DTA studies proved all metal complexes are highly stable.

Conductivity measurements helped to understand the behaviour of the ligand in complexes. The molar conductance values of all the solid complexes when dissolved in DMF were found to be very low (Chapter-VII & VIII). This indicates that the overall charge on the complex species is practically zero. When this fact was further elaborated, it clearly help us to understand that the ligand should carry with it -2 charge in order to balance +2 charge of the central metal ion. Hence it was established that the ligand exhibit as bidentate in 1:2 complexes.
The Powder X-RD diffractions for Cu(II) and La(III) metal complexes of OHBPPTH, OHBAPTH, VPTH, 2TMBAPTH, 3TMBAPTH and DHBPPTH showed sharp peaks indicative of the crystalline nature and h k l parameters came handy to prove the stable values of the complexes. (Chapter-VII & VIII).

The author has been pursuing anti bacterial activity for the synthesized new ligands and Cu(II), La(III), Co(II), Ni(II), Mn(II), Mo(VI) and Pd(II) complexes of all Schiff base ligands (Chapter-IX) and they were found to be highly active against (viz, Escherichia coli, Bacillus subtilis and Enterococcus faecails) bacteria. Confirming that chelation of metal to the ligand by increasing the toxicity of the complexes. Confirmed the inhibition nature of the complexes.

Finally, the author basing his agreement on the above information, concludes that different Schiff base of p-Toluic Hydrazide with various ketones and aldehydes such as, 2-hydroxy Benzophenone, 2-Hydroxy Benzaldehyde, 4-Hydroxy 3-methoxy Benzaldehyde, 2,4,5-Trimethoxy Benzaldehyde, 3,4,5-Trimethoxy Benzaldehyde and 2,4-Dihydroxy Benzophenone act as very good complexing agents towards many transition metal ions. By using above spectral studies it is concluded that they behave as bidentates during complexation. All the metal complexes carry no charge and are thermally stable. As no such no single technique is independent of predicting final structures of the complexes, the entire information available from all the studies is clubbed together and appropriate structures of the complexes under investigation have been formulated in Fig.IX.1-IX.7. The structures are as follows.
**Structures**

Fig. IX.1. OHPBPTTH Metal Complexes

M= Cu(II) & La(III)

Fig. IX.2. OHBAPTH Metal Complexes

M= Cu(II) & La(III)

Fig. IX.3. VPTH metal Complexes

M= Cu(II) & La(III)
M= Cu(II) & La(III)

Fig.IX.4.2 TMBAPTH Metal Complexes

M= Cu(II) & La(III)

Fig.IX.5.3 TMBAPTH Metal Complexes

M= Cu(II), La(III), Co(II), Mn(II) and Mo(IV)

Fig.IX.6. DHBPPTH Metal Complexes
Fig.IX.7. DHBPPTH Metal Complexes

M= Ni(II) and Pd(II)