

**Name of Scholar** : Rayees Ahmad Sheikh  
**Name of Supervisor** : Dr. Athar Adil Hashmi  
**Department** : CHEMISTRY  
**Title of Thesis** : Syntheses, Characterization and Biological Studies of  
Heterocyclic Macromolecules and its Transition Metal  
Complexes

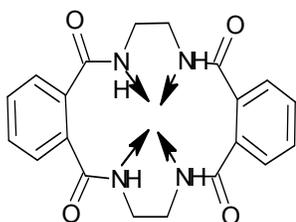
---

**ABSTRACT:**

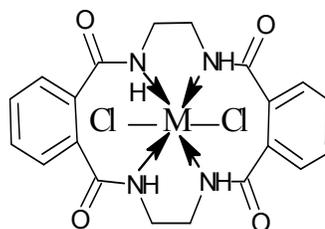
The term "*macrocyclic*", as used in coordination chemistry, refers to ligands containing a ring which is at least nine-membered and which incorporates at least three donor atoms. The "*macrocyclic effect*", of similar origin to the more familiar "*chelate effect*", sometimes refers to the modification of the properties of the metal ion when coordinated to such ligands. In general, the syntheses of complex cyclic ligands are difficult, but when a metal ion is used as a reaction "template", the preparations are simplified. It is the small ring closures and the constraint and ordering of reactants about the metal ion, which lead to an entropically favorable reaction, which facilitates the syntheses. Schiff-base macrocycles have been of great importance in macrocyclic and supramolecular chemistry. Condensation of carbonyl compounds with primary amines was discovered in 1864 by Hugo Schiff. This acid-catalyzed reaction is universal and makes it possible to obtain a broad variety of azomethines. The classical Schiff condensation using monocarbonyl compounds and amines as the starting compounds occurs with high yields. All steps in this reaction sequence are reversible. Therefore, the Schiff condensation under thermodynamically controlled conditions can be used for generating dynamic combinatorial libraries if several different amines or carbonyl compounds are used as starting compounds simultaneously. The reactions of dicarbonyl compounds with diamines are much more complicated and can produce a wide spectrum of products. This background of our research work mainly comes from the macromolecular Schiff bases. But we are more interested in modifying these type of ligand by introducing different groups atom in order to impart different properties, different geometries with different steric and electronic environment. These modifications however have lead to new Schiff bases capable of bridging different metal centers, yielding dimers or coordination polymers characterized by peculiar spectroscopic and structural features. Recently, the need for a more sophisticated macrocyclic ligand

system have grown in order to control the reactivity of the metal centre by tuning the steric and electronic factors precisely, but no example of macromolecular Schiff bases ligands containing different donating groups such as (O, N, S, P etc.) along with promising biological activity has been obtained so far. So our interest on this regard has motivated us to work in this field.

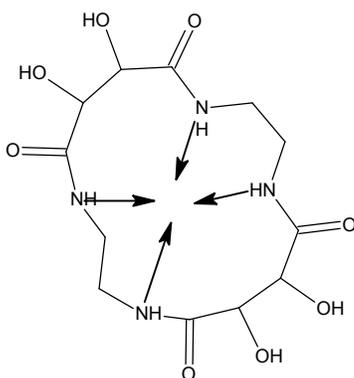
In this research work I have reported macrocyclic Schiff base ligands and its transition metal complexes. These synthesized compounds were characterized by Elemental Analysis, IR, NMR, ESI-MS, Electronic Spectroscopy, TG/DTA and Magnetic data measurements. The Co(II), Ni(II) and Cu(II) complexes show octahedral geometry around the respective metal complexes. In addition, the synthesized compounds were evaluated for their antimicrobial properties by performing MIC, Disc diffusion assay, growth kinetic studies and Cytotoxicity (MTT assay).



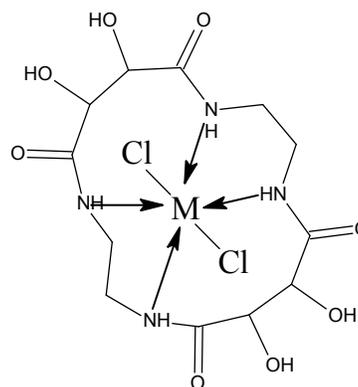
Proposed structure of the Macrocylic ligand



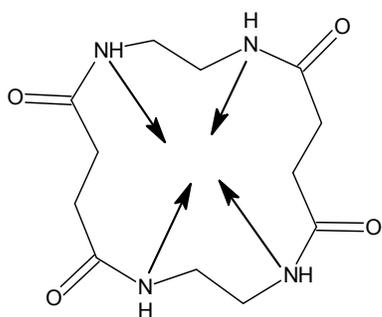
Proposed octahedral structure of metal complexes [M= Co(II), Ni(II), Cu(II)]



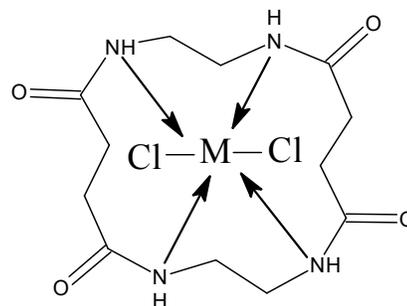
Proposed structure of the Macrocylic ligand



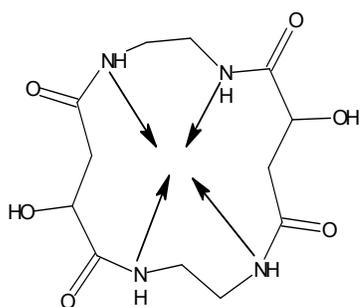
Proposed octahedral structure of metal complexes [M= Co(II), Ni(II), Cu(II)]



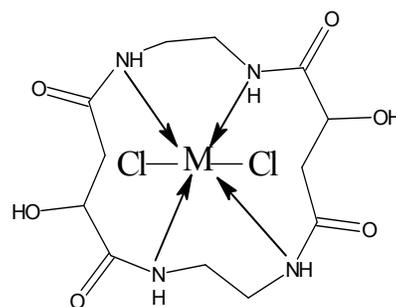
Proposed structure of the  
Macrocyclic ligand



Proposed octahedral structure of  
metal complexes [M= Co(II), Ni(II), Cu(II)]



Proposed structure of the  
Macrocyclic ligand



Proposed octahedral structure of  
metal complexes [M= Co(II), Ni(II),Cu(II)]