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An overview of Macro-cyclic and acyclic Schiff base ligands

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Abstract : Macro-cyclic and acyclic compounds have received much attention in the last twenty years. These compounds play an important role in the understanding of molecular processes in biochemistry, material science, catalysis, activation, transport and separation phenomena and so on.Many of these cyclic and acyclic ligands have been created to mimic the function of natural compounds in order to recognize and transport the specific metal ions, anions or neutral molecules, and also to realize and reproduce the catalytic activity in metallo-enzymes and proteins.

Key Words : Schiff-base ligands, macro-cyclic and acyclic Schiff base ligands

Introduction : A vast amount of macro-cyclic and acyclic Schiff base ligands have been synthesized in order to find out the important role of different donor atoms, such as their relative position, the number and size of the chelating rings formed, and the flexibility of the coordinating moiety on the selective species. The hole size of different macro-cyclic ligands represents an additional parameter for the selectivity of different charged or neutral species which can be recognized. However, the interesting properties of acyclic Schiff base ligands may increase as they have more flexibility than macro-cyclic compounds.

Macro-cyclic Schiff base ligands

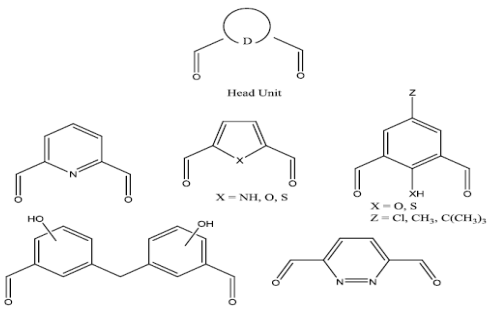

Figure : Different di-formyl precursors of head units.

Macro-cyclic Schiff base ligands have been prepared by condensation of different di-carbonyl precursors based on head units and analogous with different lateral di-amines. The macro-cyclic compounds are usually formed at [1+1] and [2+2] depending on the number of head and lateral units present. In the conditions of certain precursors, such as 2,6-diacetylpyridine and 1,3-diamino-2-hydroxypropane, the [3+3] and [4+4] macro-cyclic ligands have also been investigated. The [3+2] bicyclic101 condensation ligands have also been prepared by reaction of tri-amines with di-carbonyl precursors to achieve hexa-imine macro-bicyclic compounds

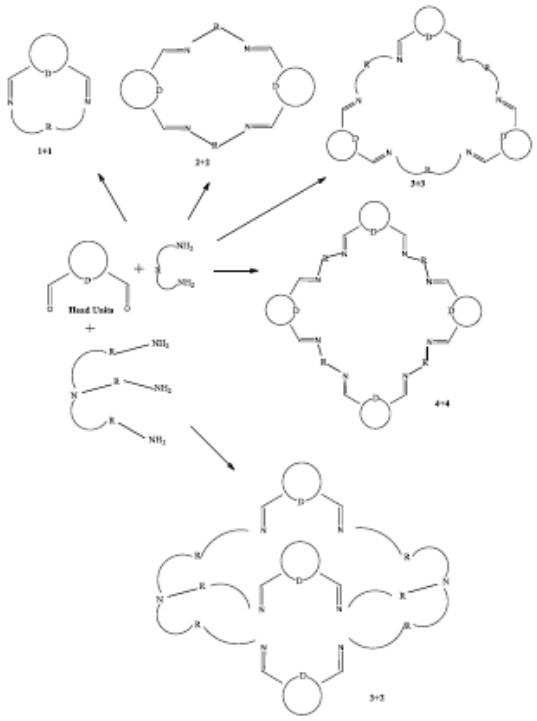

Figure : Different types of formation of macro-cyclic Schiff base ligands.

Macro-cyclic Schiff bases complexes

The word 'template' is reported by Curtis *et al*. in early 1960s who explored the use of metal template procedures for obtaining a wide range of macro-cyclic systems, and it has been widely used since that time to now. The use of template also has been utilised in the synthesis of macro-cyclic Schiff bases complexations by the cyclocondensation of dicarbonyl compounds and lateral diamines, because they are simple 'one-pot reaction', cheap and performed in high yield. New template synthesis of [1+1] macro-cyclic Schiff base copper(II) and nickel(II) complexes based on cyclocondensation of 2,6- diformyl-4-metyl-phenol and two different lateral di-amines chain (e.g. diethylenetriamine and 1,2-bis(3-aminopropylamino)ethane, respectively), have been

reported by Gurumoorthy and co-workers.103 According to the analytical data they observed, they were able to establish that the attempt to synthesize the [1+1] macro-cyclic ligands using diformyl compounds and diamines under different conditions without metal template did not achieve the expected results, where [2+2] macro-cycles were formed in all case. However, the use of metal(II) perchlorate as metal templates for the macro-cyclic reactions resulted in the [1+1] macro-cycles formation.

Moreover, the antimicrobial activity of macro-cyclic complexes of **L1** and **L2** with Cu(II) and Ni(II) salts, respectively, were examined *in vitro* with a comparison against two standard drugs, Ciprofloxacin and Clotrimazole

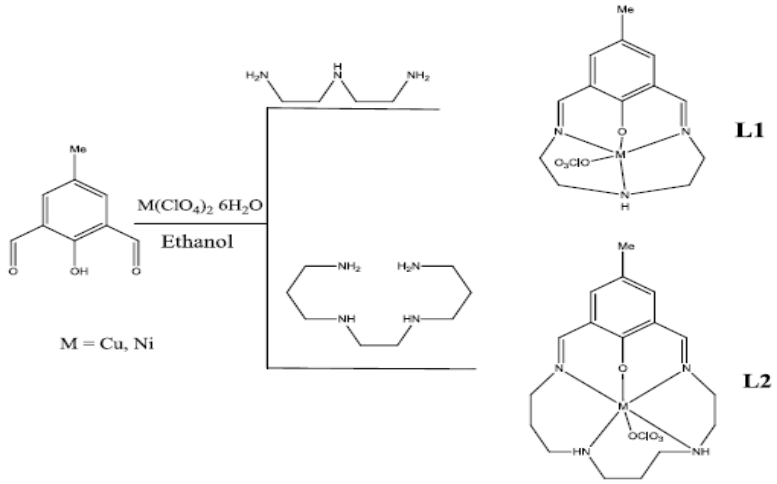

Figure : Metal template cyclocondensation in the presence of M(II) perchlorate salts.

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