

**UNIVERSITI TEKNOLOGI MARA**

**SYNTHESIS AND CHARACTERIZATION OF  
NEW MACROCYCLIC AND ACYCLIC  
SCHIFF BASE LIGANDS AND  
METAL COMPLEXES**

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## ABSTRACT

A series of macrocyclic ligands of 6,13-diphenyl-1,8-dihydro-2,3:9,10-dibenzo-1,4,8,11-tetraazacyclotetradecane-4,6,11,13-tetraene (dptaaH<sub>2</sub>) and their methoxy, methyl, nitro, bromo, and chloro derivatives as well as their Co(II), Ni(II) and Cu(II) complexes have been successfully synthesized. The ligands and their complexes are characterized by elemental analysis (CHN), infrared, <sup>1</sup>H and <sup>13</sup>C liquid and solid-state NMR spectroscopies, magnetic susceptibility as well as X-ray crystallography.

An x-ray investigation carried out on the macrocycle dptaaH<sub>2</sub> suggests that the nitrogen atoms of the ligand are almost co-planar. A cyclic voltammetry study in dimethylsulfoxide (DMSO) shows redox potentials suggesting a irreversible electron transfer phenomenon for Co(dptaa), Co(NO<sub>2</sub>dptaa) and Cu(Brdptaa).

Tetradentate acyclic ligands and complexes of N,N'-ethylenebis(salicylideneimine), N,N'-phenylenebis(salicylideneimine), bis(2-hydroxyacetophenone)ethylenediimine, bis(2-hydroxyacetophenone)phenylendiimine with Co(II), Ni(II), Cu(II), Mn(II), Sb(III) and Bi(III) complexes have been prepared. The bidentate chelate ligands of N,N'-bis(4-chlorobenzylidene)ethane-1,2-diamine, N,N'-bis(4-chlorophenylethylidene)ethane-1,2-diimine, N,N'-bis(4-methylbenzylidene)ethane-1,2-diimine with Co(II) and Ni(II) complexes are also prepared.

The structures of the ligands and complexes are elucidated by elemental analysis (CHN), infrared, <sup>1</sup>H and <sup>13</sup>C NMR, conductivity measurements, magnetic susceptibility as well as x-ray crystallography. The x-ray investigation of N,N'-bis(4-methylbenzylidene)ethane-1,2-diamine reveals that it is centrosymmetric about the central point of the ethylene bond and possesses E configuration across the azomethine (C=N) bond. The x-ray crystal structure for N,N'-bis(4-chlorobenzylidene)ethane-1,2-diamine is obtained to reveal that the crystal packing is stabilized by weak intermolecular hydrogen bonds, forming a three dimensional network.

The macrocyclic and acyclic Schiff bases and their complexes are screened against *E. coli*, *Pseudomonas sp.*, *Streptococcus sp.*, *Staphylococcus aureus* and *Salmonella typhi* for antibacterial activity. From the results, it could be concluded that the complexes are better antibacterial agents than their respective free ligands.

Attempts on synthesis of other Schiff base ligands and complexes derived from 1,8-naphthalenediamine and 2-aminothiophenol are also reported.

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