UNIVERSITI TEKNOLOGI MARA

SYNTHESIS, CHARATERIZATION AND NEUROTOXICITY SCREENING OF SCHIFF BASE LIGANDS DERIVED FROM 1,8-DIAMINONAPHTHALENE AND THEIR Cu(II), Co(II), Ni(II) AND Zn(II) COMPLEXES

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has been not submitted to any other academic institution or non-academic institution for other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating that conduct of my study and research.

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ABSTRACT

Five Schiff base ligands were successful synthesized from 1,8-diaminonaphthalene with 2-hydroacetophenone, 5-bromo-2-hydroxyacetophenone, salicyldehyde, 2-4,dihydroxybenayldehyde and 3-hydroxy-4-methoxybenzaldehyde in the ratio 1:2. Twenty complexes of Cu(II), Co(II), Ni(II) and Zn(II) with the five ligands were obtained with 1:1 ratio of ligand:metal. The chemical structures were investigated and elucidated using elemental analysis (C,H,N), infrared spectroscopy, ^{1}H and ^{13}C nuclear magnetic resonance spectroscopy, ultraviolet-visible spectroscopy, melting point measurement and magnetic susceptibility measurement. The paramagnetic Cu(II) and Co(II) complexes were observed to display ν(C=N) band in the range 1601 to 1638 cm^{-1}, while those of the diamagnetic Ni(II) and Zn(II) complexes displayed ν(C=N) band in the region 1587 to 1638 cm^{-1}. From the effective magnetic moment (μ_{eff}) values, it was indicate that the nickel(II) complexes adopted square planar geometry while all the cobalt(II) complexes were tetrahedral. The representative compounds of CoL1 and L1 showed UV-Vis absorption bands at 260 to 332 nm assignable to $\pi \rightarrow \pi^*$ transition of the aromatic systems. The band at 298 nm for ligand was likely due to $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ electron transitions of the conjugated C=C chromophore of the naphthalene and phenyl moieties. Absorption for cobalt(II) complex showed a bathocromical shift to the free ligand, caused by the coordination of metal to the ligand, in agreement with the IR spectral results. The neurotoxicity screening on treated human neuroblastoma SH-SY5Y cell lines revealed that the compound were not toxic to the cell line.

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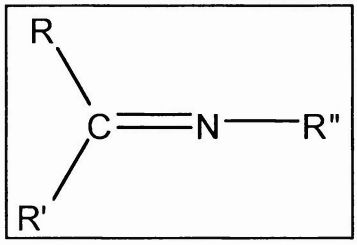
CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDIES

Hugo Schiff in 1864 described the process of condensation between aldehyde or ketone and amine to form a Schiff base (Shakir *et al.*, 2009). Schiff bases are characterized by the –N=C- (imine) group as shown in Figure 1.1 which is important in biological system (El-Ayaan *et al.*, 2005) and they can be derived from a large number of carbonyl compounds and amines (Golcu *et al.*, 2005). It was found that Schiff bases produced from salicyldehyde and its derivatives mostly yield polydentate ligands which can form stable complexes with transition metals (Rouhullahi *et al.*, 2007).

FIGURE 1.1
General structure of Schiff base



According to Sukanya *et al.* (2007), Schiff bases have special characteristics as ligands that have donor atoms to form interesting coordination modes with various metals. The significant interest in coordination chemistry is the interaction of the central metal with surrounding atoms, ions and molecules (Kurtoğlu *et al.*, 2008).

The coordination compounds of Schiff bases have been studied widely as they can be applied as important biochemical, analytical and antimicrobial agents (Golcu *et al.*, 2005). The coordination of transition metals into Schiff bases can enhance the biological activity of the ligands and decrease the cytotoxicity effect of both metal ion and ligands on the host (El-Ayaan *et al.*, 2005)

Complexes of Schiff base with first row transition metal such as Co(II), Ni(II) and Cu(II) have been reported to exhibit antifungal, antibacterial, antiviral and antitubercular activities (Lv *et al.*, 2006). Nasrabadi *et al.* (2008) stated that copper