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**SYNTHESIS OF N,N'-ETHYLENEBIS(ACETYLACETONEIMINATO) AND  
DITHIOOXAMIDO TRANSITION METAL COMPLEXES  
AND INVESTIGATION OF THEIR POTENTIAL FOR  
BINDING ANION, CATION AND SMALL MOLECULES**

A THESIS PRESENTED BY

A.M.K.S.P. Adhikari

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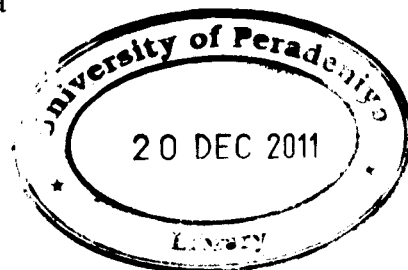
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A.M.K.S.P. Adhikari  
Department of Chemistry,  
University of Peradeniya,  
Peradeniya.  
Sri Lanka

Macrocyclic ligand complexes play a significant chemical role in many systems. Such complexes are typically very stable and show unusual structural, electronic and electrochemical properties. Recently, a novel dinickel macrocyclic complex synthesized has shown a significant affinity towards trapping halide ions. Extension of such a study to synthesize a new simple metal macrocyclic systems capable of trapping simple hazardous molecules and ions present in the environment was the major concern of this research project. In this regard, a few macrocyclic metal complexes of copper(II), nickel(II) and iron(III) were synthesized by the metal template synthesis method and characterized by using UV-visible, FTIR, NMR, XRD and CV techniques. Their binding ability with anions such as  $\text{SCN}^-$ ,  $\text{Br}^-$ ,  $\text{Cl}^-$ ,  $\text{I}^-$  and cations such as  $\text{Ag(I)}$ ,  $\text{Pb(II)}$ ,  $\text{Cd(II)}$ ,  $\text{Zn(II)}$  and  $\text{Ni(II)}$  were studied.

The nano-structured blackish complex of copper(II) synthesized with dithiooxamide (rubeanic acid) and acetylacetonate (acac) shows significant affinity towards silver(I) ions. Therefore, this complex is suitable for trapping silver ions in water. The X-ray structure of the copper(II) and nickel(II) complexes synthesized with ethylenediamine (en) and acetylacetonate (acac) were determined with the support of Wayne State University, USA. The copper(II) complex with en and acac shows the ability of binding with anions such as  $\text{SCN}^-$ ,  $\text{Br}^-$ ,  $\text{Cl}^-$  and  $\text{I}^-$ . Carbon dioxide ( $\text{CO}_2$ ) trapping capability of the complex was studied

using a CO<sub>2</sub> sensor-probe and it was observed that the complex is capable of trapping CO<sub>2</sub> up to 50 % at room temperature in methanolic medium.

A similar iron(III) complex (Fe-en-acac-R) synthesized also shows the anion binding capability and similar type of acid-base properties. Although the structures were not determined, a few attempts were made to synthesize two dimeric metal complexes of copper(II) and nickel(II) using dibromo-ortho-xylene for bridging ligand of the two monomers.