

**SCHIFF BASES AS CORROSION INHIBITORS FOR COPPER
IN HYDROCHLORIC ACID**

NURHADILAH BINTI CHE HARUN

**BACHELOR OF SCIENCE (Hons.) CHEMISTRY
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA**

MAY 2010

ACKNOWLEDGEMENTS

Alhamdulillah, all praise to Allah and blessings are upon His Prophet Muhammad S.A.W, whose ultimate guidance creates more meaningful purpose of this project by giving me strength, health, energy, ability and chances to finally complete this project successfully.

I would like to acknowledge the contribution of my supervisor, Prof. Madya Dr. Hadariah bt. Bahron. Thank you very much for her guidance, advice, comment and constant encouragement during this project. I also would like to express my gratitude to my co-supervisor, Cik Shadatul Hanom bt. Rashid for her suggestion, guidance and involvement in helping me to complete this project.

Special thanks to Cik NorLaila Ramlee for her helping in the corrosion inhibition application of this project. I also would like to thank Encik Khairul, Encik Kadim and Encik Nordin for their assistance in using the laboratory facilities. Not forgotten to all my family, other lecturers and also my friends for their guidance and encouragement in completing my project.

Nurhadilah binti Che Harun

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	x
ABSTRAK	xi
CHAPTER 1 INTRODUCTION	
1.1 Background and problem statement	1
1.2 Significance of study	4
1.3 Objectives of study	5
CHAPTER 2 LITERATURE REVIEW	
2.1 Experimental methods	6
2.2 Characterization methods	
2.2.1 Elemental analysis	13
2.2.2 Infrared Spectroscopy	14
2.2.3 ¹ H Nuclear Magnetic Resonance (NMR) Spectroscopy	15
2.2.4 Melting point determination	16
2.3 Corrosion inhibition application	
2.3.1 Electrochemical impedance spectroscopy (EIS)	17
2.3.2 Weight loss method	19

ABSTRACT

SCHIFF BASES AS CORROSION INHIBITORS FOR COPPER IN HYDROCHLORIC ACID

Five Schiff bases, *N,N'*-bis(salicylaldehyde)-1,2-ethylenediamine (salen), *N,N'*-bis(3methoxysalicylidene)-1,2-ethylenediamine (MeO-salen), *N,N'*-bis(5-nitrosalicylidene)-1,2-ethylenediamine (NO₂-salen), *N,N'*-bis(2-hydroxy acetophenone) (hapen) and *N,N'*-bis(2-hydroxy-5-nitroacetophenone) (NO₂-hapen) have been successfully synthesized by reaction of ethylenediamine with the appropriate aldehyde or ketone in the ratio 1:2. The Schiff base ligands are characterized by using elemental analysis, infrared spectroscopy, ¹H NMR spectroscopy and melting point determination. The compounds are examined for their inhibitive effect toward corrosion of copper metal in 1M hydrochloric acid by using the weight loss method. The effect of different concentrations of each compound, ranging from 0.01M to 0.0001M toward inhibiting corrosion is investigated. The results show the most effective Schiff base as an inhibitor of corrosion is MeO-salen at the concentration 0.01M with inhibiting efficiency of 64.90%.

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

Ligand is defined as a molecule or anion that contains lone pair(s) of electrons to be donated to metal centres to form complex ions or coordination compounds (Silberberg, 2006). The ligands of complex ions are molecules or anions with one or more donor atoms where each donates a lone pair of electrons to the metal ion to form a dative covalent bond. Ligands are classified in terms of the number of donor atoms, or “teeth” that each uses to bond to the central metal ion. Monodentate ligands such as Cl^- and NH_3 , have a single donor atom. Bidentate ligands have two donor atoms, each of which bonds to the metal centre. An example of a bidentate ligand is ethylenediamine (en). Polydentate ligands have more than two donor atoms. Ethylenediaminetetraacetate (EDTA) is one of the examples of polydentate ligands (Silberberg, 2006). Bidentate and polydentate ligands give rise to rings in the complex ion. For instance, ethylenediamine has a chain of four atoms ($:\text{N}-\text{C}-\text{C}-\text{N}:$), so it forms a five-membered ring, with the two electron-donating N atoms bonding to the metal atom.