

**A STUDY OF SCHIFF BASE LIGANDS AS A POTENTIAL  
CORROSION INHIBITOR FOR MILD STEEL IN ACIDIC MEDIUM**

**NURUL AMIRA BINTI MOHD RIFFIN**

**Final Year Project Report Submitted in  
Partial Fulfilment of the Requirements for the  
Degree of Bachelor of Science (Hons.) Chemistry  
in the Faculty of Applied Sciences  
Universiti Teknologi MARA**

**JANUARY 2017**

This Final Year Project entitled “**A Study of Schiff Base Ligands As A Potential Corrosion Inhibitor for Mild Steel in Acidic Medium**” was submitted by Nurul Amira Binti Mohd Riffin, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences, and was approved by

---

Nurul Huda binti Abdul Halim  
Supervisor  
B. Sc. (Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

---

Dr. Nur Rahimah binti Said  
Co Supervisor  
B. Sc. (Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

---

Dr. Tn. Sheikh Ahmad Izaddin bin  
Sheikh Mohd Ghazali  
Project Coordinator  
B. Sc. (Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

---

Mazni binti Musa  
Head of Programme  
B. Sc. (Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

Date : \_\_\_\_\_

## TABLE OF CONTENTS

	<b>Page</b>
<b>ACKNOWLEDGEMENTS</b>	<b>iii</b>
<b>TABLE OF CONTENTS</b>	<b>iv</b>
<b>LIST OF TABLES</b>	<b>vi</b>
<b>LIST OF FIGURES</b>	<b>vii</b>
<b>LIST OF ABBREVIATIONS</b>	<b>viii</b>
<b>ABSTRACT</b>	<b>ix</b>
<b>ABSTRAK</b>	<b>x</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Background of study	1
1.2 Problem statement	3
1.3 Objectives of study	4
1.4 Significance of study	4
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>5</b>
2.1 General synthesis of Schiff bases	5
2.2 Schiff base ligands	6
2.3 Application of Schiff base Ligands	7
2.3.1 Biological activities	7
2.3.2 Catalysts	8
2.3.3 Dyes	9
2.3.4 Corrosion Inhibitor	10
2.4 Corrosion inhibition study	11
2.4.1 Reaction Medium	11
2.4.2 Concentration of corrosion inhibitor	12
2.4.3 Effect of temperature	12
2.4.4 Effect of immersion time	13
<b>CHAPTER 3 METHODOLOGY</b>	<b>14</b>
3.1 Materials	14
3.1.1 Chemicals	14
3.1.2 Apparatus	14
3.1.3 Instruments	14
3.2 Synthesis of Schiff base ligands	15
3.3 Corrosion inhibition study	17
3.3.1 Effect of corrosion inhibitor concentration	19
3.3.2 Effect of immersion time	20

<b>CHAPTER 4 RESULTS AND DISCUSSION</b>	<b>21</b>
4.1 Introduction	21
4.2 Synthesis of Schiff base ligands	21
4.3 Characterization of Schiff base ligands	27
4.3.1 Elemental analysis	27
4.3.2 Fourier transform infrared (FT-IR)	28
4.3.3 NMR spectroscopy	30
4.3.4 UV-VIS analysis	38
4.4 Corrosion inhibition study	40
4.4.1 Effect of corrosion inhibitor concentration	40
4.4.2 Effect of immersion time	44
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS</b>	<b>48</b>
5.1 Conclusion	48
5.2 Recommendations	49
<b>CITED REFERENCES</b>	<b>50</b>
<b>APPENDICES</b>	<b>54</b>
<b><i>CURRICULUM VITAE</i></b>	<b>65</b>

## ABSTRACT

### A STUDY OF SCHIFF BASE LIGANDS AS A POTENTIAL CORROSION INHIBITOR FOR MILD STEEL IN ACIDIC MEDIUM

Corrosion inhibitor was used for protection of metals and alloys in dealing toward corrosion problems. Corrosion inhibitor had great acceptance in the industries due to excellent anti-corrosive properties. Three Schiff base ligands named 2-[benzylideneamino] phenol (BL1), 2-[(4-methylbenzylidene) amino] phenol (BL2) and *N*-salicylidene-4-chloroaniline (BL3) were synthesized and characterized by using elemental analysis (CHNS), IR, NMR spectrometer and UV-VIS spectroscopy. IR spectra confirm the present of C=N group in the synthesized ligand and supported by NMR result in the confirmation of the ligands structure. The corrosion inhibition of mild steel in 1 M HCl for the three synthesized ligands have been focused in this study. The results show that inhibition efficiency increases when inhibitor concentration increases and inhibition efficiency decreases with longer immersion time of mild steel in acidic medium. The effectiveness of these inhibitor decreased in the order of BL3>BL1>BL2. BL3 shows the most percentage inhibition efficiency among the other two ligands. The inhibition efficiency of BL3 can increase in percentage up to 97.60 % is due to the presence of the benzene ring and the C=N group can form a strong  $\pi$  bond where the HOMO electron in electronegative chlorine donates it electron toward unoccupied orbitals (LUMO) of iron steel. The inhibitor efficiency increase from 6 hours to 18 hours due to increase in adsorption of protective film toward metal surface. Increase in desorption of protective film on the metal surface can be seen from 18 hours to 78 hours resulting in decreasing in inhibition efficiency.