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POLYETHYLENE GLYCOL (PEG) AS CORROSION INHIBITOR FOR STEEL IN  
AN ACIDIC ENVIRONMENT

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STEEL IN AN ACIDIC ENVIRONMENT**

**ANIS LIYANA FATINI BINTI AHMAD FADZIL**

**Final Year Project Report Submitted in  
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## ABSTRACT

### **POLYETHYLENE GLYCOL (PEG) AS CORROSION INHIBITOR FOR STEEL IN ACIDIC ENVIRONMENT**

Corrosion of stainless steel in acidic environments remains a critical issue in industry, where exposure to hydrochloric acid (HCl) can cause severe damage to the function of equipment and machinery used in the industry. The use of polyethylene glycol (PEG) as corrosion inhibitor in an acidic media has a limitation in an adsorptivity that may result in low inhibition efficiency. The addition of other chemicals such as imidazoline and zinc (II) ion ( $Zn^{2+}$ ) is a good approach in enhancing the inhibition. However, it may raise environmental concerns and economical aspect. Thus, in this study a specific concentration range of PEG 2000 is used to investigate its capability in inhibiting corrosion in acid. This study investigates PEG as a low-toxicity corrosion inhibitor for SUS304 stainless steel in acidic environments (HCl) solutions. This investigation has focused on immersion tests using PEG 2000 concentrations ranging from 0.015 M to 0.2 M in 1 M and 0.5 M HCl. Inhibition behaviour was evaluated through weight loss measurements which were used to evaluate the inhibition efficiency of PEG on stainless steel in HCl solutions. Surface analysis was performed using optical microscope to identify inhibited and uninhibited steel surface. Fourier Transform Infrared Spectroscopy (FTIR) was used to confirm the presence of functional groups important in the corrosion inhibitor for adsorption on the steel surface. The results showed a significant reduction in corrosion rate with increasing PEG concentration. At the highest concentration tested, 0.2 M PEG, the inhibition efficiency reached 83.02% in 0.5 M HCl and 70.60% in 1 M HCl. In the absence of PEG, the corrosion rate values were in the poor range, while the PEG treated samples shifted to fair and good classifications. The results from the observation of the samples under optical microscopy were evident that the smoother surface in the PEG inhibited specimens confirmed the formation of a protective film on the steel surface. This study highlights the potential of PEG as a sustainable corrosion inhibitor condition, offering a safer and more environmentally friendly solution for industrial applications involving acidic conditions and provides valuable insights for designing green corrosion protection strategies.

## TABLE OF CONTENTS

	<b>Page</b>
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	ii
<b>ACKNOWLEDEMENT</b>	iii
<b>TABLE OF CONTENTS</b>	iv
<b>LIST OF TABLES</b>	vi
<b>LIST OF FIGURES</b>	vii
<b>LIST OF SYMBOLS</b>	ix
<b>LIST OF ABBREVIATIONS</b>	xi
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Research Background	1
1.2 Problem Statement	5
1.3 Research Questions	6
1.4 Objectives	6
1.5 Significance of Study	6
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Introduction to Polymer Surfactant	8
2.1.1 Source of Polymer Surfactant	8
2.1.2 Types and Properties of Polymer Surfactant	10
2.1.3 Application of Polymer Surfactant	13
2.2 Polymer Surfactant	14
2.2.1 Classification of Polymer Surfactant	14
2.2.2 Effectiveness and Factors Influence Polymer Surfactant on Corrosion Protection	15
2.2.3 Polymer Surfactant as Corrosion Inhibitor in Acidic Medium	17
2.3 Polyethylene Glycol	18
2.3.1 Properties of Polyethylene Glycol	18
2.3.2 Application of Polyethylene Glycol in Industry	20
2.3.3 Polyethylene Glycol as Corrosion Inhibitor	22
2.4 Stainless Steel SUS304	24
2.4.1 Properties of Stainless Steel SUS304	24
2.4.2 Application of SUS304 Stainless Steel	25
2.4.3 Corrosion of SUS304 Stainless Steel	27
2.4.4 Corrosion Inhibition of Stainless Steel in Acidic Medium	29
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 Introduction of Chapter	33
3.2 Materials	33
3.2.1 Raw Materials	33

3.3 Chemicals	34
3.4 Equipment and Apparatus	35
3.5 Instrument	35
3.6 Characterization of Polyethylene Glycol (PEG)	36
3.6.1 Fourier Transform Infrared Spectroscopy (FTIR)	36
3.7 Corrosion Test	36
3.7.1 Preparation of Stainless Steel Specimen	36
3.7.2 Preparation of Corrosive Medium	37
3.7.3 Preparation of Corrosion Inhibitor	38
3.8 Immersion Test	39
3.8.1 Flow Chart of Immersion Test	42
3.9 Summary of Parameter	43
3.10 Surface Analysis	43
3.10.1 Optical Microscope	43
3.11 Experimental Design/Flow Chart	44
<b>CHAPTER 4 RESULT AND DISCUSSION</b>	
4.1 Analysis on Preparation of Corrosive Medium and Corrosion Inhibitor	45
4.1.1 HCl as Corrosive Medium	45
4.1.2 PEG as Corrosion Inhibitor	46
4.2 Synthesis and Characterization of Corrosion Inhibitor	47
4.3 Influence of HCl Solution Concentration on the Rate of Corrosion of Stainless Steel	49
4.4 Weight Loss Measurement	53
4.4.1 Effect of Varying Concentration Inhibitors	54
4.5 Surface Morphology Analysis Using Optical Microscope (OM)	58
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS</b>	
5.1 Conclusion	64
5.2 Recommendations	66
<b>REERENCES</b>	68