

**THE CORROSION INHIBITION OF MILD STEEL IN
ACIDIC MEDIA BY THE ADSORPTION OF *PSIDIUM*
GUAJAVA PLANT EXTRACT**



**A PROJECT WORK SUBMITTED TO THE DEAN OFFICE
DEPARTMENT OF CHEMISTRY
DAMAK MULTIPLE CAMPUS
INSTITUTE OF SCIENCE AND TECHNOLOGY
TRIBHUVAN UNIVERSITY
NEPAL**

**FOR THE AWARD OF
BACHELOR OF SCIENCE IN CHEMISTRY**

**BY
DEEPA DHIMAL
T.U ROLL NO: 502020045
T.U REGD. NO: 5-2-0202-0025-2017
April, 2022**

BOARD OF EXAMINATION AND CERTIFICATE OF APPROVAL

This project work (PRO-406) “**THE CORROSION INHIBITION OF MILD STEEL IN ACIDIC MEDIA BY THE ADSORPTION OF PSIDIUM GUAJAVA PLANT EXTRACT**” by Deepa Dhimal, Symbol No.: **502020045** and TU Regd. no.: **5-2-0202-0025-2017** under the supervision of Mr. Dilli Ram Pokhrel in the Department of Chemistry, Damak Multiple Campus, Institute of Science and Technology, TU, is hereby submitted for the partial fulfillment for the requirement of Bachelor’s Degree of Science in Chemistry at Damak Multiple Campus. This report has been accepted and forwarded to the controller of examination, Institute of Science and Technology, TU, Nepal for the legal procedure.

Dilli Ram Pokhrel

Supervisor

Department of chemistry

Damak multiple campus

Damak-9, Jhapa

Prof. Dr. Ajay Bhattarai

External Examiner

Department of chemistry

Mahendra Morang campus

Biratnagar, Morang

Mr

Internal Examiner)

Department of chemistry

Damak multiple campus

Damak-9, Jhapa

Mr. Ghanashyam Dahal

Head of Department

Department of chemistry

Damak multiple campus

Damak-9, Jhapa

LETTER OF FORWARD

Date:/...../.....

On the recommendation of **Mr. Dilli Ram Pokhrel**, this project work is submitted by **Deepa Dhimal**, Symbol No.: 502020045, TU Regd. No.: 5-2-0202-0025-2017, Entitled **“THE CORROSION INHIBITION OF MILD STEEL IN ACIDIC MEDIA BY THE ADSORPTION OF PSIDIUM GUAJAVA PLANT EXTRACT”** is forwarded by the Department of Chemistry, Damak Multiple Campus for the approval of the evaluation committee, Institute of Science and Technology (IoST), TU Nepal.

Mr. Ghanashyam Dahal

Head of Department

Department of chemistry

Damak multiple campus

Damak-9, Jhapa

RECOMMENDATION

It is certified that Miss. **Deepa Dhimal**, Symbol No. 502020045, T.U Reg 5-2-0202-0025-2017 has carried out the project work entitled “**THE CORROSION INHIBITION OF MILD STEEL IN ACIDIC MEDIA BY ADSORPTION OF *PSIDIUM GUAJAVA* PLANT EXTRACT**” for the requirement to the project work in bachelor of science (B.Sc.) degree in chemistry under my supervision in the department of chemistry, Damak Multiple Campus, Institute of Science and Technology, Tribhuvan University (T.U), Nepal.

To my knowledge, this work has not been submitted for any other degree.

She has completed all of the requirements set forth by the Institute of Science and Technology (IoST), Tribhuvan University (T.U), Nepal for the submission of project work for partial fulfillment of a Bachelor of Science in Chemistry degree.

Dilli Ram Pokhrel

Supervisor

Department of Chemistry

Damak multiple campus

Damak, jhapa

Date.....

DECLARATION

I, Deepa Dhimal here by declared that the research work entitled" **THE CORROSION INHIBITION OF MILD STEEL IN ACIDIC MEDIA BY THE ADSORPTION OF THE *PSIDIUM GUAJAVA* PLANT EXTRACT**" done for the partial fulfilment of bachelor of science in chemistry is the genuine work that has been carried out under the supervision of our honorable teacher Mr. Dilliram Pokhrel in Damak Multiple Campus.

I ensure that it has been published or submitted elsewhere for the requirement of any degree program. Any literature, data or work done by other cited with in this dissertation has been listed in the references as the author of the thesis, further declared that I am related to its creation and did not infringe the copyright of third parties.

Deepa Dhimal

B.Sc 4th year

Symbol No. 502020045

TU Reg :5-2-0202-0025-2017

April, 2022

ACKNOWLEDGEMENT

The abstruse of project work might not have been affable without a helping hand. The circumstances of verve and perspicuous knowledge in the respective topic played a vital role in narrowing the tedious work. I have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations.

I would like to express my special gratitude and thanks to my supervisor Dilliram Pokhrel, the ultimate dynamic person who helped me providing all the technical support as well as the theoretical part. Thank u sir for the abundant resources and the replies in mails without arrogance.

The special acknowledgement also goes to the Head of Department of Chemistry Assoc. Ghanshyam Dahal and special thanks and sincere respect to Mr. Surya Subba, Head of laboratory of Damak Multiple Campus for his thoughtful suggestion and co-ordination in my project work.

I would like to extend my sincere thanks to all of them. I am highly indebted to Damak Multiple Campus (Department of Chemistry) for their guidance and constant supervision as well as for providing necessary information regarding the project and also for their support in completing the project.

I would like to express my gratitude towards my parents and members of my group Sudikshya Niroula, Srijana Thatal and Ramala Niroula for their kind cooperation and encouragement which helped me in completing this project.

Deepa Dhimal

B.Sc 4th year

Symbol No. 502020045

TU Reg : 5-2-0202-0025-2017

April, 2022

ABSTRACT

Guava leaf as a natural extract which is used as green inhibitor was studied as corrosion inhibitor for mild steel immersed in the acidic medium of two different concentration i.e 1M and 1.5M HCL and was studied by using weight loss method. The result obtained from the weight loss method revealed that corrosion increases with increasing acid concentration whereas the corrosion rate decreases with the increase in inhibitor concentration. It is associated with the action of corrosive medium with the MS sample and the active phytochemical constituent present in the inhibitor. The maximum inhibition efficiency was found to be 78.90% at 30ml *Psidium guajava* extract inhibitor concentration and the maximum corrosion rate was found to be 53gram per m²hr at 1.5ml.

Keywords: *Corrosion, Inhibition, Psidium guajava, green inhibitor*

LIST OF ACRONYMS AND ABBREVIATIONS

cm: centimeter

CR: Corrosion Rate

EIS: Electrochemical Impedance Spectroscopy

ml: milliliter

gm: gram

hr.: hour

I.E: Inhibition Efficiency

MS: Mild Steel

SEM: Scanning Electron Microscopy

LIST OF SYMBOLS

Δ Difference

θ Surface Coverage

% Percentage

LIST OF TABLES

Table 1: Corrosion parameters for mild steel in 1M and 1.5M HCL in absence and presence of inhibitor concentration.

LIST OF FIGURES

Figure 1: *Psidium Guajava*

Figure 2: Atmospheric corrosion

Figure 3: Aqueous corrosion

Figure 4: Concrete corrosion

Figure 5: Uniform corrosion

Figure 6: Galvanic corrosion

Figure 7: Dry corrosion

Figure 8: Crevice corrosion

Figure 9: Wet Corrosion

Figure 10: Soil Corrosion

Figure 11: Pitting corrosion

Figure 12: Hot air oven

Figure 13: Digital weighing machine

Figure 14: Mild Steel Sample

Figure 15: Desiccator

Figure 16: *Psidium* extract

Figure 17: *Psidium* inhibitor

Figure 18: Soxhlet Apparatus

Figure 19: Variation of weight loss with the concentration of *Psidium* extract

Figure 20: Variation of corrosion rate with the concentration of *Psidium* extract

Figure 21: Variation of inhibitor efficiency with the concentration of *Psidium* extract

Figure 22: Variation of surface coverage with the concentration of *Psidium* extract

TABLE OF CONTENT

| | |
|---|-------------|
| Cover Page..... | i |
| Board of examination and certificate of approval..... | ii |
| Letter of forward..... | iii |
| Recommendation..... | iv |
| Declaration | v |
| Acknowledgement..... | vi |
| Abstract..... | vii |
| Acronyms and abbreviation..... | viii |
| List of symbols..... | ix |
| List of table..... | x |
| List of figure..... | xi |
| CHAPTER 1: INTRODUCTION..... | 1-15 |
| 1.1 General Introduction..... | 1 |
| 1.2 Types of corrosion..... | 2 |
| 1.3 Cause of corrosion..... | 14 |
| 1.4 Importance of corrosion..... | 14 |
| 1.5 Cost of corrosion..... | 14 |
| 1.6 Prevention..... | 14 |
| 1.7 Scope of corrosion..... | 15 |
| 1.8 Objectives..... | 15 |
| 1.9 Limitation | 15 |

| | |
|---|--------------|
| CHAPTER 2: LITERATURE REVIEW | 16-19 |
| CHAPTER 3: MATERIALS AND METHODOLOGY..... | 20-22 |
| 3.1 Equipment..... | 20 |
| 3.2 Chemical reagent..... | 20 |
| 3.3 Extraction | 20 |
| 3.4 Materials preparation | 20 |
| 3.5 Test media | 21 |
| 3.6 Weight loss..... | 22 |
| CHAPTER 4: RESULTS AND DISCUSSION..... | 23-26 |
| 4.1 Effect of concentration on weight loss..... | 23 |
| 4.2 Effect of concentration on corrosion rate | 24 |
| 4.3 Effect of concentration on inhibition efficiency..... | 25 |
| 4.4 Effect of concentration of surface coverage..... | 26 |
| CHAPTER 5: CONCLUSION AND RECOMMENDATION..... | 27 |
| 5.1 Conclusion | 27 |
| 5.2 Recommendation for further research work..... | 27 |
| REFERENCE..... | 28-30 |