UNIVERSITI TEKNOLOGI MARA

KINETIC ANALYSIS OF PLASTIC POLYETHYLENE TEREPHTHALATE (PET)

MUHAMMAD RIDZWAN BIN ROSDI

This report is submitted in partial fulfillment of the requirements needed for the award of Bachelor in Engineering (Hons) Chemical

Bachelor of Engineering (Hons) Chemical

Faculty of Chemical Engineering

July 2019

ABSTRACT

This study provides the effect of temperature on mass change of plastic over time by using Thermogravimetric Analysis (TGA).The main objectives includes studying the thermal degradation and kinetic analysis of 20mg plastic Polyethylene terephthalate (PET). Thermal degradation was done by using a Thermogravimetric analyzer with temperature range from 25°C to 800°C at varies heating rates. Calculated kinetics parameters obtained by using Ozawa Flynn and wall (OFW) method are 86.764 KJ/mol for the activation energy (Ea) and $1.29x10^{10}$ min^{-1} for the pre exponential factor (A).

ACKNOWLEDGEMENT

Firstly, I wish to thank Allah for giving me ample time to complete this research .Then, I would like to express my sincere gratitude to my Supervisor Dr. Rusmi Alias for the guidance, encouragement and endless support in completing my final year project successfully.

Moreover, I would like to thank Dr. Farah Hanim Abd Hamid as the coordinator for Research Project two for her assistance in keeping the research progress on schedule .Also I would like to thank my Faculty of Chemical Engineering and special thanks to all lab assistants that helping me conducting the experiment .

Last but not least, I would like to express my beloved thanks to my family for a constant support in my project. Only Allah can pay all your kindness.

TABLE OF CONTENTS

Page

CONFIRMATION BY PANEL OF EXAMINERS i

DECLARATION ii

CERTIFICATION iii

ABSTRACT v

ACKNOWLEDGEMENT vi

LIST OF TABLES ix

LIST OF FIGURES x

LIST OF ABBREVIATIONS xi

LIST OF SYMBOLS xii

CHAPTER 1 : INTRODUCTION 1

1.1 BACKGROUND STUDY 1

1.2 PROBLEM STATEMENT 2

1.3 OBJECTIVES 3

1.4 SCOPE OF RESEARCH 3

CHAPTER 2 : LITERATURE REVIEW 4

2.1 THERMAL DEGRADATION 4

2.2 PROXIMATE ANALYSIS 4

2.3 CALORIFIC VALUE 5

2.3.1 The Difference between Higher and Lower Heating Values 6

2.4 PLASTIC PYROLYSIS 7

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND STUDY

One of the most contributors to municipal solid waste is plastic(Das & Tiwari, 2017). The most common type of plastic is Polyethylene terephthalate or commonly abbreviated as PET or PETE. For the past year, there is a drastic growth of plastic industry especially in the production Polyethylene terephthalate and polystyrene .In 1990, the production plastic was estimated to be 80 million tonnes and the consumption of plastic material in Western Europe in year 2004 was 43.5 million tonnes (Al-Salem & Lettieri, 2010).

As the population in Malaysia increase, the plastic consumption also increased. Plastic and the other solid waste usually disposed by two method which are landfilling and incineration .However this two method is no more relevant due to the lack of available land for dumping(Das & Tiwari, 2017). PET waste plastic is combination of hydrocarbon, benzene and oxygen and PET plastic has high percentage of oxygen content.

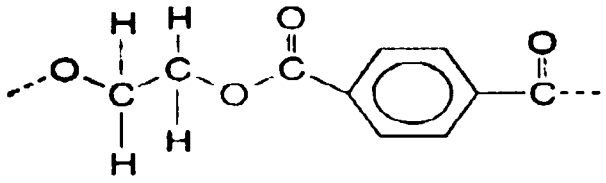

Figure 1.1 Chemical structure of PET

Figure 1.2 Symbol of PET