

UNIVERSITI TEKNOLOGI MARA

**THE EFFECT OF TREATED KENAF
FIBER ON HDPE/GLASS FIBER
HYBRID COMPOSITE:
CHARACTERIZATION AND
MECHANICAL PROPERTIES**

NUR NADQIRAH BINTI ABD JAMIN

Final year project report submitted in partial fulfillment
of the requirements for the degree of **Degree of Bachelor
of Sciences (Hons.) Polymer Technology**

Faculty of Applied Sciences

JULY 2019

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Nur Nadqirah Binti Abd Jamin
Student I.D. No.	:	2017413026
Programme	:	Degree of Bachelor of Sciences (Hons.) Polymer Technology – AS243
Faculty	:	Applied Sciences
Thesis Title	:	The Effect of Treated Kenaf Fiber on HDPE/Glass Fiber Hybrid Composite: Characterization and Mechanical properties
Signature of Student	:
Date	:	July 2019

ABSTRACT

Composites of HDPE/Glass fiber reinforced with treated kenaf fiber have been prepared by melt mixing. The effect of kenaf fiber loading at 5, 10, and 15 % on mechanical and physical properties of composite sample were studied. FTIR Spectra show the removal of hemicellulose and reduction of OH group present in kenaf fiber surface after modification. DSC result indicated better thermal stability of kenaf fiber after surface modification is slightly increased of melting temperature from 25.01°C to 25.04°C and markedly increased in enthalpy from 282.6 J/g to 315.7 J/g compared to unmodified kenaf fiber. There are increase in tensile strength and tensile modulus at optimum loading of 5 % of kenaf fiber due to good bondability and wettability among the matrix and treated filler. Further increase (10 and 15%) kenaf fiber loading have resulted to reduced tensile strength and tensile modulus due to dispersion and agglomeration of filler in polymer matrix. In elongation at break, the neat HDPE is the highest percent elongation at break. However, the percent elongation at break becomes decreased when reinforced with glass fiber which tends to be more brittle or stiff for the composite sample. In further increasing kenaf fiber loading at 10 and 15 %, it shows the decreasing in percent elongation at break due to the poor interfacial adhesion between filler and matrix. From impact strength, it shows the declined trend of HDPE/Glass fiber reinforced with kenaf fiber in increasing amount of kenaf fiber. This result of impact strength is opposite to theory whereas the impact strength decreased as the decreased in percent crystallinity in high filler loading. This is may cause by the formation of voids during compression molding process. Water absorption showed higher percentage as increase amount of kenaf fiber loading due to OH group existed on the filler. However, comparison data of all properties from untreated and treated kenaf fiber at 5% indicating that treated fiber have higher values than untreated fiber.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMIERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBEREVIATIONS	xi
CHAPTER 1: INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	3
1.3 Objectives of Study	4
1.4 Significant of Study	4
CHAPTER 2: LITERATURE REVIEW	5
2.1 Polymer Composite	5
2.1.1 Polymer Hybrid Composite	5
2.2 Natural Fiber	6
2.2.1 Kenaf Fiber	7
2.3 Polyethylene	8
2.3.1 High Density Polyethylene (HDPE)	9
2.4 Synthetic Fiber	11
2.4.1 Glass Fiber	11
2.5 Surface Modification of Natural Fiber	12
CHAPTER 3: METHODOLOGY	15
3.1 Materials and Chemicals	15
3.2 Equipments	15
3.3 Preparation of Kenaf Fiber	15

3.4	Preparation of HDPE Reinforced Glass Fiber/Kenaf Fiber Hybrid Composite	16
3.5	Testing and Characterization	16
3.5.1	Fourier Transform Infrared Spectrometer (FTIR)	17
3.5.2	Different Scanning Calorimeter (DSC)	17
3.6	Mechanical Testing	17
3.6.1	Tensile Test	17
3.6.2	Impact Test	18
3.7	Physical Testing	18
3.7.1	Water Absorption Test	18
3.8	Steps in Preparing HDPE Reinforced Glass Fiber/Kenaf Fiber Hybrid Composite	19
 CHAPTER 4: RESULTS AND DISCUSSION		20
4.1	Fourier Transform Infrared Spectroscopy (FTIR) of Kenaf Fiber	20
4.2	Different Scanning Calorimetry (DSC)	21
4.3	Effect of treated kenaf fiber loading on mechanical properties of HDPE/Glass fiber hybrid composite	23
4.3.1	Tensile properties	23
4.3.2	Impact strength	27
4.4	Effect of 5% kenaf fiber loading on mechanical properties of untreated and treated of HDPE/Glass fiber/Kenaf fiber hybrid composite	29
4.4.1	Tensile properties	29
4.5	Effect of water absorption on HDPE/Glass fiber/Kenaf fiber hybrid composite	32
 CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS		34
5.1	Conclusions	34
5.2	Recommendations	35
 REFERENCES		36
AUTHOR'S PROFILE		42