

UNIVERSITI TEKNOLOGI MARA

**STRENGTH AND DURABILITY OF
COMPRESSION MOULDED HIGH
FILLER LOADING KENAF CORE
AND BAST FIBRE PARTICULATE
REINFORCED POLYETHYLENE
COMPOSITE**

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requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledge as referenced work. The topic has not been submitted to any other academic institution or non-academic institution for any other 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.

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ABSTRACT

Kenaf bast fibre and kenaf core have been used in the production of wood plastic composite (WPC) mainly for automotive applications and also as particleboard. However, there is a lack of study on the usage kenaf in WPC for decking application. Therefore, the aim of this study is to develop WPC with high filler loading of kenaf core/bast for decking application. This composite was made using matrix of high-density polyethylene (HDPE) with kenaf core and bast as filler. Kenaf core/bast polyethylene composite (KPC) was made through extrusion and compression (hot-press) moulding with varying formulations based on different percentage of kenaf core and bast fibre (70/0, 60/10, 50/20, 40/30)wt.% incorporated into high-density polyethylene (HDPE) matrix. The experimental works have been divided into four phases. First phase is to determine the best molarity of chemical solution for treatment of the kenaf fibre based on analyse of surface morphology, density and tensile strength. Second phase is to optimise the flexural properties, moisture absorption and thickness swelling of composite by varying the weight percentages (wt.%) of kenaf core filler. In the phase three, the physical and mechanical properties of KPC at higher filler loading were investigated. The best formulation of KPC from phase three were further investigated on physical and flexural properties of KPC expose to different environmental conditions (20°C-65%RH, 20°C-95%RH, 30°C-95%RH, 50°C-95%RH as well as soaking in water at room temperature). In fourth phase the diffusion theory has been applied to understand the mechanism of moisture absorption in composites. Two mathematical models were developed in this work; one model is to simulate the moisture movement through the composites in long-term exposure and another model is to describe the hygroscopic swelling process of KPC. The effects of moisture absorption on the flexural and dynamic mechanical of KPC were further investigated. Based on the experimental results, it was observed that KPC filled with 60 wt.% of core and 10 wt.% of bast treated with 0.06M MgCl₂ indicate the optimum formulation due to high values in flexural strength, MOE, tensile strength, tensile modulus and impact energy. As for long time exposure, the moisture absorption of KPC increased as temperature and relative humidity increased. However, flexural strength and MOE of the composite is slightly higher than the standard requirement according to ASTM D 6662-01.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xxi
LIST OF FIGURES	xv
LIST OF PLATES	xix
LIST OF SYMBOLS	xxiv
LIST OF ABBREVIATIONS	xxvi
CHAPTER ONE: INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem Statement	3
1.3 Research Objectives	6
1.4 Significance of Study	7
1.5 Scope of Study	8
1.6 Limitation and Parameter of Study	10
CHAPTER TWO: LITERATURE REVIEW	11
2.1 Overview of Wood plastic composite	11
2.2 Wood plastic Composite Decking	13
2.3 Thermoplastic Matrices in Wood Plastic Composite	16
2.3.1 High Density Polyethylene (HDPE)	17
2.4 Natural Fibre as Filler in WPCs	19
2.4.1 Structural Organisation of Natural Fibre Cell Wall	21
2.4.2 Chemical Properties of Natural Fibre	23
2.4.2.1 Cellulose	24

2.4.2.2	Hemicellulose	26
2.4.2.3	Lignin	27
2.4.2.4	Pectins	28
2.4.3	Kenaf	29
2.4.3.1	Industrial Kenaf in Malaysia	30
2.4.3.2	Morphology of Kenaf	31
2.4.3.3	Structure and Chemistry of Kenaf	33
2.4.4	Challenging in Utilizing Natural Fibre	35
2.4.4.1	Hydrophilicity of Fibre	36
2.4.4.2	Poor Fibre Compatibility into the Matrix	38
2.4.4.3	Inconsistence Fibre Properties	38
2.5	FillerMatrix Interface	38
2.5.1	Chemical Modification of Natural Fibre	39
2.5.1.1	Alkaline Treatment	40
2.5.2	Surface Modification through Coupling Agents	44
2.6	Manufacturing process of Wood Plastic Composite	47
2.6.1	Extrusion compounding	48
2.6.2	Compression Moulding	50
2.7	Factor Affecting the Mechanical and Physical Properties of WPCs	51
2.7.1	Effects of Coupling Agent Concentration	52
2.7.2	Effect of Natural Fibre Loading	53
2.7.3	Effect of Size of Particle Size	55
2.8	Moisture Uptake in Wood Plastic Composite	57
2.8.1	Mechanism of Moisture Transport	58
2.8.2	Factor Effecting the Diffusion Coefficient	62
CHAPTER THREE: METHODOLOGY		664
3.1	General	64
3.2	Research Design	65
3.3	Raw Material Preparation	66
3.3.1	Kenaf core and bast Fibre	66
3.3.2	High Density Polyethylene (HDPE)	68
3.3.3	Maleic Anhydride Grafted Polyethylene (MAPE)	69