

**PROPERTIES OF PARTICLEBOARDS MADE FROM  
RUBBERWOOD (*hevea brasiliensis*) AND  
KENAF (*hibiscus cannabinus* L.) CORE**

**SYED MUHAMMAD AZLAN BIN SAYED IDRUS**

**Final Year Project Report Submitted in  
Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science (Hons.) Furniture Technology  
in the Faculty of Applied Science,  
Universiti Teknologi MARA**

**JANUARY 2013**

## TABLE OF CONTENTS

	Page
<b>APPROVAL SHEET</b>	i
<b>CANDIDATE'S DECLARATION</b>	ii
<b>ACKNOWLEDGMENTS</b>	iii
<b>TABLE OF CONTENTS</b>	v
<b>LIST OF TABLE</b>	vii
<b>LIST OF FIGURES</b>	ix
<b>LIST OF PLATES</b>	x
<b>LIST OF ABBREVIATIONS</b>	xi
<b>ABSTRACT</b>	xiv
<b>ABSTRAK</b>	xv
<b>CHAPTER 1: INTRODUCTION</b>	1
1.1 Background of Study	4
1.2 Problem Statement	4
1.3 Objectives of Study	5
<b>CHAPTER 2: LITERATURE REVIEW</b>	7
2.1 Particleboard	7
2.1.1 General Descriptions	8
2.1.2 Properties of Particleboard	8
2.1.2.1 Physical and Mechanical Properties	9
2.2 Rubberwood	9
2.2.1 Rubberwood In Malaysia	11
2.2.2 Properties of Rubberwood	13
2.2.2.1 Appearance	13
2.2.2.2 Working Properties	14
2.2.2.3 Physical & Mechanical Properties	14
2.2.3 Rubberwood applications	14
2.2.3.1 Fuelwood	15
2.2.3.2 Wood chips	15
2.2.3.3 Sawn timber	16
2.2.3.4 Wooden furniture	16
2.2.3.5 Mouldings, parquetry, strip flooring, and joinery	16
2.2.3.6 Panel Products from rubberwood	17
2.3 Kenaf	18
2.4 Adhesive as Bonding Material	21
2.4.1 Urea Formaldehyde (UF)	21

<b>CHAPTER 3: MATERIALS AND METHODS</b>	24
3.1 Materials	24
3.2 Preparation of Samples	24
3.2.1 Flaking	24
3.2.2 Screening	25
3.2.2 Drying	26
3.2.3 Weight	26
3.2.4 Glue Mixing and Blending	27
3.2.5 Mat Forming	28
3.2.6 Cold Press	28
3.2.5 Hot Press	29
3.2.6 Conditioning	29
3.2.7 Trimming and Size	30
3.2.8 Sample Cutting	30
3.3 Modulus of Rupture (MOR) and Modulus of Elasticity (MOE)	31
3.4 Internal Bond (IB)	32
3.5 Thickness Swelling	33
<b>CHAPTER 4: RESULTS AND DISCUSSION</b>	34
4.1 Modulus of Rupture (MOR) and Modulus of Elasticity (MOE) Data	34
4.2 Internal Bonding (IB) and Thickness Swelling (TS) Data	37
4.3 Bulk Density Data	42
4.4 Summary of ANOVA Analysis	43
4.5 Modulus of Rupture (MOR) Analysis	43
4.6 Modulus of Elasticity (MOE) Analysis	44
4.7 Internal Bonding (IB) Analysis	45
4.8 Thickness Swelling (TS) Analysis	46
<b>CHAPTER 5: CONCLUSION AND RECOMMENDATION</b>	48
<b>REFERENCES</b>	50
<b>APPENDICES</b>	53
<b>CURRICULUM VITAE</b>	62

## LIST OF TABLES

<b>Table</b>	<b>Title</b>	<b>Pages</b>
2.1	Production and Consumption of Rubberwood logs (2001-2005)	13
2.2	Showing the properties of rubberwood	18
2.3	Showing the specifications of Urea Formaldehyde adhesive	23
3.1	Showing the ratio of rubberwood and kenaf core particles	27
3.2	Showing the tests sample size for each particleboard	30
3.3	Showing modified Table from EN 312-3:1996 for standard values of particleboard mechanical properties	31
4.1	MOR and MOE values of 100% rubberwood sample.	34
4.2	MOR and MOE values of 90% rubberwood sample.	35
4.3	MOR and MOE values of 80% rubberwood sample.	35
4.4	MOR and MOE values of 70% rubberwood sample.	35
4.5	MOR and MOE values of 60% rubberwood sample.	36
4.6	MOR and MOE values of 50% rubberwood sample.	36
4.7	IB and TS values of 100% rubberwood sample.	37
4.8	IB and TS values of 90% rubberwood sample.	38
4.9	IB and TS values of 80% rubberwood sample.	39
4.10	IB and TS values of 70% rubberwood sample.	40
4.11	IB and TS values of 60% rubberwood sample.	41
4.12	IB and TS values of 50% rubberwood sample.	42
4.13	Bulk Density of Rubberwood and Kenaf Core.	42

## ABSTRACT

### **PROPERTIES OF PARTICLEBOARDS MADE FROM RUBBERWOOD (*hevea brasiliensis*) AND KENAF (*hibiscus cannabinus* L.) CORE**

This study investigates the potential of kenaf core as a substitute material to rubber wood for producing particleboard. By handling this investigation, the optimum ratio between rubber wood and kenaf core is determined as well as the physical and mechanical properties of the particleboard. Therefore, high quality of particleboard using partial kenaf and rubber wood that comparable to 100% rubber wood is produced. Investigation is done by preparing samples according to 6 types of ratios. Each ratio has 3 samples. The samples were tested by four different tests which are Modulus Of Rupture (MOR) in purpose to find the bending strength, Modulus Of Elasticity (MOE) in order to find its modulus of elasticity perpendicular to the plane, Internal Bonding (IB) to determine the tensile strength perpendicular to the plane of the test sample and finally Thickness Swelling. From the results obtained, it can be concluded that using kenaf core as substitute material to rubber wood in producing particleboard can be done. This is proven as all tested samples satisfied the EN standard for all tests except Thickness Swelling.