EFFECTS OF RUBBER SEED SHELL MICROPARTICLE ADDITION ON POLYPROPYLENE/KENAF COMPOSITE

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA (UTeM)

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This report is submitted with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Engineering Materials) (Hons.)

by

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2014

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Effects of Rubber Seed Shell Microparticle Addition on Polypropylene/Kenaf Composite.**

SESI PENGAJIAN: **2013/14 Semester 2**

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Sukacita dimaklumkan bahawa Laporan PSM yang tersebut di atas bertajuk ***"*Effects of Rubber Seed Shell Microparticle Addition on Polypropylene/Kenaf Composite*"*** mohon dikelaskan sebagai SULIT / TERHAD untuk tempoh LIMA (5) tahun dari tarikh surat ini.

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I hereby, declared this report entitled 'Effects of rubber seed shell microparticle addition on polypropylene/kenaf composite' is the results of my own research except as cited in references.

Signature : ……

Author's Name : Muhammad 'Izzat Syahmi Bin Firdaus

Date : 23rd June 2014

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment to the requirements for the degree of Bachelor of Manufacturing Engineering (Engineering Materials) (Hons.). The member of the supervisory is as follow:

……..

(Dr Mohd Edeerozey Bin Abd Manaf)

ABSTRACT

Natural fiber is one of the potential candidates to be used with the thermoplastic as a composite. Kenaf fiber has the potential to replace synthetic fiber in thermoplastic composite as it is particularly environmentally friendly and far cheaper than synthetic fiber. The purpose for this research is to study the effect of rubber seed shell microparticle addition on polypropylene/kenaf composite. Kenaf fiber was mixed with polypropylene (PP) in addition of rubber seed shell powder (RSSP) as filler and maleic anhydride grafted polypropylene (MAgPP) as coupling agent. The composite is made up of 70% PP and 30% kenaf fiber. The varied parameter is the amount of the added RSSP i.e., 0, 3, 5 and 10 phc. The size of the RSSP used in this study is 45µm except for 5 phc RSSP, in which two different sizes are used (45µm and 90µm) in order to investigate the effect of size. The mixture was compounded with plastic mixer and molded by compression molding. Several tests were done to analyze the physical and mechanical properties of samples such as water absorption test, tensile test, flexural test and impact test. The data obtained from these test will be supported by morphological analysis by using Scanning Electron Microscopy (SEM). From the results obtained, it can be concluded that RSSP addition, as well as process parameter influence the properties of the composite. RSSP addition certainly improve the properties of the composite. In particular, composite added with 90µm RSSP give better results compared to 45µm except for flexural strength.

ABSTRAK

Serat semula jadi adalah salah satu calon yang berpotensi untuk digunakan dengan termoplastik sebagai komposit. Gentian kenaf berpotensi untuk menggantikan serat sintetik dalam komposit termoplastik kerana sifatnya yang mesra alam dan harganya jauh lebih murah daripada serat sintetik. Kajian ini bertujuan untuk mengkaji kesan terhadap tambahan serbuk halus kulit biji getah pada komposit polipropilena/kenaf. Gentian kenaf dicampurkan dengan polipropilena (PP) serta tambahan serbuk halus kulit biji getah (RSSP) sebagai pengisi manakala acetic maleic polipropilena (MAgPP) sebagai ejen gandingan. Komposit ini terdiri daripada 70% PP dan 30% gentian kenaf. Pemboleh ubah untuk komposit tersebut ialah kandungan serbuk halus kulit biji getah (RSSP) iaitu 0, 3, 5 dan 10 phc RSSP. Saiz RSSP untuk kajian ini ialah 45µm kecuali untuk 5phc RSSP, kerana saiz berbeza digunakan iaitu 45µm dan 90µm untuk menyiasat kesan terhadap saiz RSSP. Campuran ini sebatikan dengan pengadun plastik dan dibentuk oleh pengacuan mampatan. Beberapa ujian telah dijalankan untuk menganalisis ciri-ciri fizikal dan mekanikal sampel seperti ujian penyerapan air, ujian tegangan, ujian lenturan dan ujian impak. Data yang diperoleh daripada ujian ini akan disokong dengan analisis morfologi dengan menggunakan Imbasan Elektron Mikroskop (SEM). Dari keputusan yang diperolehi, ini dapat disimpulkan bahawa penambahan RSSP dan juga pemboleh ubah proses mempengaruhi ciri-ciri komposit. Penambahan RSSP telah menambah baik ciri-ciri komposit. Selain itu, komposit dengan saiz 90µm RSSP memberi keputusan yang lebih baik berbanding dengan saiz 45µm.

DEDICATION

To my beloved mother and father and my family for their continuous support.

To my supervisor for his guidance and advice in completing this research.

To all my friends for their continuous support and help in completing this report.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

ASTM	-	American Society for Testing and Materials
CMC	-	Ceramic matrix composite
GPa	-	GigaPascal
HDPE	-	High density polyethylene
kgf	-	Kilogram force
kJ	-	KiloJoule
ksi	-	Kilo pound per square inch
LDPE	-	Low density polyethylene
MAgPP	-	Maleic anhydride grafted polypropylene
MMC	-	Metal matrix composite
MPa	-	MegaPascal
MPIC	-	Ministry of Plantation Industries and Commodities
msi	-	Milli pound per square inch
NKTB	-	National Kenaf and Tobacco Board
PE	-	Polyethylene
phc	-	per hundred compound
PMC	-	Polymer matrix composite

PP	-	Polypropylene
PSA	-	Particle Size Analyzer
PVC	-	Polyvinyl chloride
PVF	-	Polyvinyl fluoride
RISDA	-	Rubber Industry Smallholders Development Authority
rpm	-	Revolution per minute
RSS	-	Rubber seed shell
RSSP	-	Rubber seed shell powder
SEM	-	Scanning electron microscopy
SI Unit	-	International System of Units
T_g	-	Glass transition temperature
UTeM	-	Universiti Teknikal Malaysia Melaka
UTM	-	Universal testing machine
UTS	-	Ultimate tensile strength
%	-	Percentage
^oC	-	Degree of Celcius
θ	-	Angle