MECHANICAL CHARACTERIZATION OF UNSATURATED POLYESTER COMPOSITE FILLED MODFIED KENAF FIBER

RESEARCH MANAGEMENT INSTITUTE (RMI)
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR
MALAYSIA

BY :
SUZANA BINTI RATIM
HEAD OF PROJECT

Prof Madya DR RAHMAH MOHAMED
MEMBER 1

DR SITI NORASMAH SURIP
MEMBER 2

OKTOBER 2012

Contents

Surat Kami : 600-RMI/ST/DANA 5/3/Dst (144/2008)
Tarikh : 14 November 2008

Suzana bt Ratim
Ketua Projek
Fakulti Sains Gunaan
40450 Shah Alam
UITM MALAYSIA

Prof Madya Dr Rahmah bt Mohamed
Ahli Projek
Institut Sains
40450 Shah Alam
UITM MALAYSIA

Dr Siti Norasmah bt Surip
Ahli Projek
Fakulti Sains Gunaan
40450 Shah Alam
UITM MALAYSIA

Tuan/Puan,

TAJUK PROJEK PENYELIDIKAN DANA KECEMERLANGAN: CHARACTERIZATION OF UNSATURATED POLYESTER COMPOSITE FILLED MODIFIED KENAF FIBER

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan Institut Pengurusan Penyelidikan (RMI) telah meluluskan cadangan penyelidikan yang telah dikemukakan oleh tuan/puan bertajuk di atas dengan syarat-syarat seperti berikut:

i. Tempoh projek penyelidikan ini ialah 1 tahun, iaitu bermula **1 November 2008** hingga 30 Oktober **2009.**

ii. Kos yang diluluskan ialah sebanyak **RM10,000.00 sahaja** dalam ***(Kategori C).*** Tuan/Puan diminta mengemukakan proposal beserta bajet yang baru mengikut kos yang diluluskan sebelum tuan/puan memulakan projek penyelidikan tuan/puan.

iii. Pembelian peralatan komputer adalah tidak diluluskan.

iv. Tiada biodata penyelidik.

v. Semua pembelian bahan/peralatan adalah diminta agar tuan/puan mematuhi prosedur perbendaharaan di mana pembelian melebihi RM500.00 hendaklah mengemukakan sebutharga dan borang analisa harga.

iv. Pihak tuan/puan dikehendaki mengemukakan laporan prestasi secara ringkas pada bulan Disember 2008 sepanjang penyelidikan tuan/puan berjalan.

1.2 Enhanced Executive Summary

The effects of the mechanical properties of polyester composite filled kenaf fiber were investigated. Mechanical properties of natural fiber composites highly depend on the chemical bonding formed between matrix and fiber. However, hydrophilic nature of natural fiber causes incompatible reaction between these two constituents. Therefore, chemical modification is introduced to increase interfacial bonding among them. Unsaturated polyester composites filled kenaf fiber was prepared via hand lay-up process. Chemical treatment of kenaf fiber with NaOH is first introduced to remove impurities and other constituents on the fiber surface in order to get pure cellulose fiber. Treated and untreated kenaf fiber was mixed with different ratio of unsaturated polyester matrix. These studies comprised of three stages where kenaf fiber were first treated with 6% of NaOH solution followed by modification of kenaf fiber by Maleic Anhydride (MAN). Mechanical characterizations of treated and untreated composites sample were tested through flexural, tensile and impact testing. The highest value of tensile strength is 18.3 N/mm achieved by composite sample treated with MA and prior treatment of NAOH. The same result goes to modulus of elasticity and impact samples with 2500 N/mm and 5.63 kJ/m^2. On the other hand, flexural properties showed inconsistency of value for all types of samples. Adhesion formed by kenaf fiber and UPR is studied by looking of fracture surface of tensile test samples. SEM morphological studies showed that strong bonding formed at the interface region of kenaf and UPR resin.

Introduction

Lignecellulosic fibers such as jute, ramie, kenaf, coir have attracted consideration as alternative materials to replace synthetic fiber and other conventional reinforcements. These natural fiber composite combine good mechanical properties with low specific mass ad offer alternative materials for glass fiber reinforced plastics in some technical application (Gassan 2002).

Despite the attractiveness of natural fiber reinforced polymer matrix composites, they suffer from lower modulus, lower strength and relatively poor moisture resistance compared to synthetic fiber reinforced composites (Thwe and Liao, 2002). One difficulty that has prevented the use of natural fibers is the lack of good adhesion with polymeric matrices (Bessadok et al. 2008). According to Gassan 2002, their high level of moisture absorption, poor wettability by non-polar plastic and insufficient adhesion between untreated fibers and polymer matrix lead to debonding with age.

The presence of hydroxyl and other polar groups in natural fiber, moisture uptake can lead to weak interfacial bonding between the fibers and hydrophobic polymer matrices (Thwe and Liao, 2002). In particular, the great moisture sorption of natural fibres adversely affects adhesion with hydrophobic matrix leading to premature ageing by degradation and loss of strength reactions (Bessadok et al. 2008). Previous study shown that degradation of mechanical properties caused by higher moisture uptake of natural fiber (Karmaker 1997). Interfacial adhesion and resistance to moisture absorption of natural-fibre composites can be improved by treating these fibres with suitable chemical reactions (Bessadok et al. 2008).

It is necessary to enhance the hydrophobisity of natural fiber by chemical treatments with suitable coupling agents or coating with appropriate resin to develop better mechanical properties and environmental performance (Thwe and Liao, 2002).