UNIVERSITI PUTRA MALAYSIA

EFFECTS OF REPEATED WATER AND DOMESTIC BLEACH IMMERSION ON KENAF FIBRE-REINFORCED POLYPROPYLENE COMPOSITES

WAN MOHAMAD HANIFFAH BIN WAN HUSSIN

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By

WAN MOHAMAD HANIFFAH BIN WAN HUSSIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science

September 2011

DEDICATION

My Mother, Rahmah Abdullah

My Father, Wan Hussin Wan Yusoff

My Wife, Soleha Ahmad

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

EFFECTS OF REPEATED WATER AND DOMESTIC BLEACH IMMERSION ON KENAF FIBRE-REINFORCED POLYPROPYLENE COMPOSITES

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December 2011

Chairman : Mohd. Sapuan b. Salit, PhD, PEng

Faculty : Engineering

Most applications of natural fibre composite intended for environment free from water in order to avoid degradation in mechanical properties due to high water absorption property of the natural fibre composites. The aim of this research is to study the pattern of liquid content of kenaf fibre reinforced polypropylene composites and general changes in tensile properties caused by cyclic immersion and also the difference between cyclic and continuous immersion effect on tensile properties of the composites.

The pattern of liquid contents in the composites were compared between 40 and 60% fibre loadings composites under cyclic immersion for 4 cycles, where each cycle consist of 3 days of immersion and 4 days of conditioning in room temperature (28°C and 55% humidity). The liquids used for immersion were water and bleach (16.17% v/v). Results shown that, for both fibre loadings, liquid content pattern for composites immersed in bleach deviate from composites under water immersion. The deviations were more obvious when numbers of cycles were increased.

Although liquid contents in composites were increased from cycle to cycle; for the same total duration of immersion, the amount of liquid content in composites immersed under cyclic immersion were less than continuous immersion for all composites.

Among 3 factors studied in cyclic immersion; statistical analysis has shown that fibre compositions in the composites and cycle of immersion gave significant influence on tensile strength of the composites while liquid of immersion (difference between water and bleach) only significant on fourth cycle of immersion. On the other hand, tensile moduli were influenced by all the studied factors. As a conclusion, bleach did influence tensile modulus of the composites but did not significantly influenced tensile strength of the composites until the forth cycle of immersion.

The type of immersion (cyclic and continuous immersion) also influenced tensile properties of the composites. Statistically, tensile strength of the composites showed significant difference between cyclic and continuous immersion only occurred for composite immersed in bleach. Nevertheless statistical analysis showed that tensile moduli of the composites were not significant between cyclic and continuous immersion. The results conclusively showed that types of immersions (continuous and cyclic immersion) only cause significant difference in tensile strength of composites immersed in bleach.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PENGARUH RENDAMAN AIR DAN PELUNTUR DOMESTIK BERULANG KOMPOSIT POLIPROILENA BERTETULANG GENTIAN KENAF

Oleh

WAN MOHAMAD HANIFFAH WAN HUSSIN

Disember 2011

Pengerusi : Mohd. Sapuan Salit, PhD, PEng

Fakulti : Kejuruteraan

Kebanyakan penggunaan komposit gentian asli disasarkan bagi persekitaran bebas daripada air untuk menggelakkan degradasi sifat-sifat mekanikal disebabkan ciri penyerapan air yang tinggi bagi komposit gentian asli. Tujuan penyelidikan ini ialah untuk memplajari corak kandungan cecair dalam komposit polipropilena diperteguh gentian kenaf dan perubahan-perubahan am dalam ciri-ciri tegang disebabkan oleh rendaman berkitar dan juga perbezaan antara rendaman berkitar dan berterusan terhadap ciri-ciri ketegangan komposit.

Corak kandungan cecair dalam komposit dibandingkan di antara komposit bermuatan 40 dan 60% gentian dalam rendaman berkitar untuk 4 kitaran, di mana setiap pusingan terdiri daripada 3 hari rendaman dan disesuaikan selama 4 hari dalam suhu bilik (28°C dan 55% kelembapan). Cecair digunakan untuk rendaman ialah air dan peluntur (16.17% v / v). Keputusan membuktikan bahawa, untuk kedua-dua muatan gentian, corak kandungan cecair untuk komposit direndam dengan peluntur menyimpang daripada komposit yang direndam dalam air. Penyimpangan lebih ketara apabila blangan kitaran telah ditambah. Walaupun kandungan cecair

dalam komposit telah meningkat dari satu kitaran ke kitaran yang lain; bagi jumlah masa rendaman yang sama, jumlah kandungan cecair dalam komposit yang direndam melalui rendaman berkitar berkurang berbanding rendaman berterusan untuk semua komposit.

Antara 3 faktor yang dikaji dalam perendaman berkitar; analisis statistik membuktikan yang kandunga gentian dalam komposit dan kitaran rendaman memberi pengaruh penting pada kekuatan tegangan komposit manakala cecair rendaman (perbezaan antara air dan peluntur) hanya ketara pada rendaman kitaran keempat. Sebaliknya, moduli tegang dipengaruhi oleh semua faktor-faktor yang dikaji. Kesimpulannya, peluntur sememangnya mempengaruhi modulus tegangan komposit tetapi tidak begitu mempengaruhi kekuatan tegangan komposit sehinggalah rendaman pada kitaran keempat.

Jenis rendaman (rendaman berkitar dan berterusan) juga mempengaruhi ciri-ciri ketegangan komposit. Secara statistik, kekuatan tegangan komposit menunjukkan perbezaan antara rendaman berkitar dan berterusan hanya ketara untuk komposit direndam dengan peluntur. Walau bagaimanapun analisis statistik menunjukkan yang moduli tegang komposit antara rendaman berkitar dan berterusan tidak ketara. Keputusan-keputusan dengan pasti menunjukkan bahawa jenis-jenis rendaman (rendaman berterusan dan berkitar) hanya ketara bagi kekuatan tegangan komposit yang direndam dengan peluntur.

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I certify that a Thesis Examination Committee has met on 30 December 2011 to conduct the final examination of Wan Mohamad Haniffah bin Wan Hussin on his Master of Science thesis entitled "Effects of Repeated Water and Domestic Bleach Immersion on Kenaf Fibre-Reinforced Polypropylene Composites" in accordance with Universities and University College Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The committee recommends that the student be awarded the Master of Science.
Members of the Examination Committee are as follows:

Luqman Chuah Abdullah, PhD
Professor
Faculty of Engineering
Universiti Putra Malaysia
(Chairman)

Zulkiflle b. Leman, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

Edi Syams bin. Zainudin, PhD
Senior Lecturer
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

Hazizan b. Md. Akil, PhD
Associate Professor
School of Materials and Mineral Resources Engineering
Universiti Sains Malaysia
(External Examiner)

SEOW HENG FONG, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 23 April 2012

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

Mohd. Sapuan Salit, PhD, PEng
Professor
Faculty of Engineering
Universiti Putra Malaysia
(Chairman)

Khalina Abdan, PhD
Senior Lecturer
Faculty of Engineering
Universiti Putra Malaysia
(Member)

BUJANG BIN KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

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WAN MOHAMAD HANIFFAH BIN WAN HUSSIN

Date: 30 December 2011

TABLE OF CONTENTS