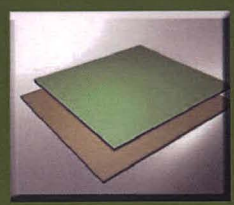
ADVANCES IN COMPOSITE MATERIALS



Iskandar Idris Yaacob
Md Abdul Maleque
Zahurin Halim

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

ADVANCES IN COMPOSITE MATERIALS

Iskandar Idris Yaacob
Md Abdul Maleque
Zahurin Halim

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Iskandar Idris Yaacob, Md Abdul Maleque & Zahurin Halim: Advances in Composite Materials.

ISBN: 978-967-418-231-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

Table of Content

Chapter 024

Impact Strength Behaviour of The Woven and Chopped Fiber Glass Composites At Different Temperatures

Ahmed Nazrin Md Idriss[1] and Shahjahan Mridha[2]
[1, 2]Faculty of Engineering – International Islamic University Malaysia
✉: nazrinidriss@yahoo.com; shahjahan@iium.edu.my

Keywords: Fiber glass composite, fractography, impact strength, volume fraction, temperature.

Abstract: Glass fiber composite has emerged to be an alternative material for replacing structures made by metallic element which was formerly known to be the dominance in the commercial structure industries. In this work, plain weave and chopped strand fiber glass composites have been fabricated using the conventional hand-lay up method. The Charpy impact energy for both woven and chopped fiber decreases from + 50 to –50 °C. The woven fiber composite with 52 vol% at 50°C gave the highest energy of 400 kJm^{-2} while it was only at 271 kJm^{-2} for the chopped composite under the same processing conditions. The lowest energy are 230 and 186 kJm^{-2} with 70 vol% and 68 vol% for woven and chopped fiber, respectively. The lesser energy absorption with the chopped fiber is presumed to be related to the shorter length of the chopped fiber that caused a lesser resistance to pull out compared to the continuous fiber with the woven fiber composite. The composite failure at +50°C gave plastic deformation with mixed fracture mode of fiber splitting, buckling, matrix and fiber cracking and delaminations and these failures were lower for the -50°C fractured specimens The plastic deformation at +50°C contributed to higher energy absorption compared to those fractured at -50°C for both fiber composites.

Introduction

Glass fiber composites have been extensively used in many areas because of their known desirable properties. Fiber glass composite material has the following favourable characteristics and those are good strength-to-weight ratio, good dimensional stability, good resistance to heat, cold, moisture, and corrosion, good electrical insulation properties, ease of fabrication, and relatively low cost. Because of this, the material is very popular to be used in aerospace, military, civil engineering and motorsport industry [1].

Lee et al. [2] found that the Charpy impact energy of unidirectional fiber glass/epoxy composite increases with increased of fiber content to 65 vol% and the dominant failure found was fiber breakage and pull-out from the matrix. However, increasing the fiber volume fraction beyond 65 vol% progressively reduces the energy absorption and the failure occurred by interlaminar cracking without fiber breakage. Asad [3] has demonstrated that the impact energies increases with increase of test temperature using aramid, glass and mild steel samples under dynamic Charpy impact load. Thomason [4] showed Charpy impact energy increases linearly with increase of test temperatures from -40°C to +80°C using samples fabricated at different fiber content and sizes. Jazar et al. [5] observed almost constant impact