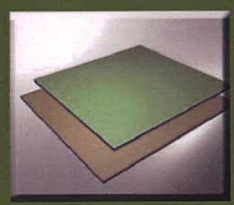
ADVANCES IN COMPOSITE MATERIALS



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IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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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

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Chapter 021

Architecture of Chopped Fiber Glass in Plastic Composite Processed Under Different Loads

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Keywords: Chopped fiber glass composite, compaction force, volume fraction, architecture.

Abstract: Fiber glass is used as reinforcement for plastic matrices to form structural composites and moulding compound. This material has paved its own path to be an alternative solution at many engineering field replacing metallic materials. In this work, chopper fiber glass composite has been fabricated using the conventional hand-lay up method. The fiber volume fraction was found to linearly increase with increased of processing load from 98 N to 1947 N. Application force at 1940 N produces composite sample at 68vol% of fiber. The high application force eliminates more matrix from being impregnated in the composite thus decreases the sample thickness. Fabricating at the force of 589 N produces 44 vol% of fiber fraction resulting greater epoxy matrix impregnation with an increase of sample thickness. The randomly distributed fiber filaments are likely to reduce the flow of liquid epoxy under respected compaction force. Similar fiber orientation was found on the composite samples produced using the force at 589 N and 1947 N suggesting applied force is insignificant to disorient fiber filaments.

Introduction

The macrofactors on composite fabrication which have direct impact to influence the composite properties are, fiber plies orientation, compaction force, matrices, curing and manufacturing process. However, the microfactors which are the fiber length, diameter, orientation and architecture and density also plays an important role here. The properties of the composite changes if either macro or microfactor changes.

Previous study by Saunders et al. [1] shows increasing the compression load resulted in an increased of fiber volume fraction. The micro structural study had resulted deformed fiber yarns with an increased applied force thus decreasing composite thickness. Bannister et al. [2] observed that the weaved fiber architecture suffers high amount of distortion and crimping at 6.9 kPa compared to 4.14 kPa. They also found that a greater amount of compaction, which increased distortion, reduced the strength of the material though it possessed a slightly higher fiber volume fraction. Other experiments using orthogonal fiber architecture and layer interlock offset architecture also indicate the similarities of the volume fraction and architecture effect. This phenomenon concludes that the increasing of fiber nesting, crimping and volume fraction is proportional to the increased of compaction pressure. Simacek et al. [3] reported that the compression analysis of plain woven fabric has a maximum value of 58 fiber vol%. The warp and weft of the yarn's geometric parameters was