Processability and tensile performance of continuous glass fiber/polyamide laminates for structural load-bearing applications

M. Nikforooz, M. Golzar, M.M. Shokrieh, J. Montesano

PII: S1359-835X(17)30409-8
DOI: https://doi.org/10.1016/j.compositesa.2017.11.010
Reference: JCOMA 4831

To appear in: *Composites: Part A*

Received Date: 29 July 2017
Revised Date: 7 November 2017
Accepted Date: 14 November 2017

Please cite this article as: Nikforooz, M., Golzar, M., Shokrieh, M.M., Montesano, J., Processability and tensile performance of continuous glass fiber/polyamide laminates for structural load-bearing applications, *Composites: Part A* (2017), doi: https://doi.org/10.1016/j.compositesa.2017.11.010

Processability and tensile performance of continuous glass fiber/polyamide laminates for structural load-bearing applications

Nikforooz, M[1,3], Golzar, M[1*], Shokrieh, MM[2], Montesano, J[3]

[1] Department of Mechanical Engineering, Tarbiat Modares University, Jalaale-al Ahmad Ave., P.O. Box 14115-143, Tehran, Iran
[2] Composite Research Laboratory, Center of Excellence in Experimental Solid Mechanics and Dynamics, School of Mechanical Engineering, Iran University of Science and Technology (IUST), Narmak, 16846-13114 Tehran, Iran
[3] Department of Mechanical & Mechatronics Engineering, University of Waterloo, 200 University Ave. West, Waterloo, Canada N2L3G1
* Corresponding author (m.golzar@modares.ac.ir; Tel. +98-21-82884320)

Abstract

The performance of continuous E-glass/polyamide 6 laminates processed using distinct hot press moulding cycles was assessed and compared with similar E-glass/epoxy and E-glass/polypropylene laminates. The effects of peak processing temperature, preheating time, and temperature dwell time on laminate consolidation and quality were observed using optical and scanning electron microscopy. Corresponding quasi-static tensile tests were performed on $[0]_8$, $[90]_8$, $[0_2/90_2]_s$ and $[\pm45]_{2s}$ laminates. Compared to E-glass/epoxy composites, the $[0]_8$ specimens presented a similar strength, while the $[90]_8$ specimens exhibited a much lower strength due to weaker fiber/matrix adhesion. Conversely, the E-glass/polyamide cross-ply laminates had a markedly higher strength while exhibiting the same modulus. This is because of higher toughness; the polyamide matrix provides as was proved by higher transverse matrix cracking strain of E-glass/polyamide. These findings support the feasibility of producing cost-effective and high-quality E-glass/polyamide laminates for use in high-performance applications, which is an attractive alternative to more conventional glass/epoxy laminates.

Keywords: A. Polymer-matrix composites (PMCs); A. Thermoplastic resin; B. Mechanical properties; D. Mechanical testing; E. Compression moulding

1 Introduction

Thermoplastic composite materials are attracting major interest in different industry sectors due to their many advantages when compared to thermosetting based composites, including the high ductility and toughness, good chemical resistance characteristics, recyclability, as well as the weldability.