Accepted Manuscript

Evolution of single carbon and glass fibrous tow cross-sections in dry and lubricated states during compaction perpendicular to the fibers

A. Sakkalatty Dharmalingam, J. Hemmer, A.-S. Lectez, C. Binetruy, S. Comas-Cardona

PII: S1359-8368(18)30815-1

DOI: 10.1016/j.compositesb.2018.05.001

Reference: JCOMB 5671

To appear in: *Composites Part B*

Received Date: 13 March 2018

Revised Date: 26 April 2018

Accepted Date: 2 May 2018

Please cite this article as: Dharmalingam AS, Hemmer J, Lectez A-S, Binetruy C, Comas-Cardona S, Evolution of single carbon and glass fibrous tow cross-sections in dry and lubricated states during compaction perpendicular to the fibers, *Composites Part B* (2018), doi: 10.1016/j.compositesb.2018.05.001.

TITLE: Evolution of single carbon and glass fibrous tow cross-sections in dry and lubricated states during compaction perpendicular to the fibers

AUTHORS: A. Sakkalatty Dharmalingam, J. Hemmer, A-S. Lectez, C. Binetruy, S. Comas-Cardona*

GeM Institute, UMR CNRS 6183, Ecole Centrale de Nantes, 1 rue de la Noe, 44321 Nantes Cedex 3, France

*corresponding author: sebastien.comas@ec-nantes.fr

ABSTRACT:

Fibrous fabrics are used in a variety of applications, among them, for structural composites. Most fabrics are efficiently manufactured from tows or yarns. During textile manufacturing or during fiber reinforced composites manufacturing, the fabrics and tows undergo several movements and deformations. Although there have been several attempts by different authors to model micro structural mechanical behavior of fabrics, they often suffer from unknown geometric dimensions at various loads or unknown materials' mechanical parameters. This paper presents a method for measuring and comparing tows (or yarns) geometrical evolution during compaction perpendicular to the fibers. The tows are compacted and dimensions are continuously measured using confocal chromatograph. Fabrics and tows of the study are composed of glass or carbon fibers, in dry or lubricated states. Volume, compacity evolutions and Poisson's ratio are extracted for a wide range of compaction levels. Tables of material characteristics and experimental data are also provided for a further use or analysis.

KEYWORDS: Tow; Yarn; Poisson's ratio; Chromatic Confocal Scanner; Compaction; Compacity

1 INTRODUCTION

Fabrics and textiles are used for many technical applications and composite solutions. Tows and yarns are key constituents for textile manufacturing (e.g., weaving, knitting, stitching, braiding or automated (robotized) fiber placement). For advanced structural composite applications, glass or carbon tows are often chosen. Depending on the applications and the manufacturing processes, the tows can either be dry, lubricated or saturated by different fluids. The latter will become, after crystallization or polymerization, the matrix of organic composite materials. Within textile or fibrous architectures, tows can be in some locations quite free