Accepted Manuscript

Microscopical observations of inter-fibre failure under tension

Elena Correa, María Inmaculada Valverde, María Luisa Velasco, Federico París

PII: S0266-3538(17)32323-0

DOI: 10.1016/j.compscitech.2017.12.009

Reference: CSTE 6997

To appear in: *Composites Science and Technology*

Received Date: 16 September 2017

Revised Date: 8 December 2017

Accepted Date: 8 December 2017

Please cite this article as: Correa E, Valverde MaríInmaculada, Velasco MaríLuisa, París F, Microscopical observations of inter-fibre failure under tension, *Composites Science and Technology* (2018), doi: 10.1016/j.compscitech.2017.12.009.

Microscopical observations of inter-fibre failure under tension

Elena Correa*, María Inmaculada Valverde, María Luisa Velasco, Federico París
Departamento de Mecánica de Medios Continuos y Teoría de Estructuras, Grupo de Elasticidad y Resistencia de Materiales, Escuela Técnica Superior de Ingeniería, Universidad de Sevilla, Camino de los Descubrimientos s/n, 41092, Sevilla, España
*Corresponding author ecorrea@us.es

Abstract

The numerical study of the inter-fibre failure at micromechanical level predicts the appearance of different stages in the development of this damage mechanism; these studies have also allowed the main features of each stage (such as the interfacial debond length and the kinking angle) to be identified.

The development of experimental studies aiming to check the relevance of the aforementioned numerical results is crucial. Based on this, this research focused on the tensile test under different loading levels of specimens manufactured from carbon-epoxy cross-ply symmetrical laminates. The microscopic observation of the 90º layers leads to the analysis of the appearance of the transverse cracks as a function of the load, the identification of the previously numerically predicted stages of the mechanism of damage, the measurement of key parameters and the evaluation of the influence of nearby fibres. A clear connection between the numerical and experimental results has been found.

Keywords: B. debonding; C. transverse cracking; D. optical microscopy; cross-ply

1. Introduction

Matrix/Inter-fibre failure arises in plies subjected to transverse loads, being characteristic, among others, of 90º plies belonging to cross-ply laminates subjected to loads parallel to their 0º plies.

Previous numerical studies allowed the identification of three main stages in the