# Accepted Manuscript


A novel material degradation model for unidirectional CFRP composites

Libin Zhao, Yang Li, Jianyu Zhang, Longwei Zhou, Ning Hu

PII: S1359-8368(16)32549-5

DOI: 10.1016/j.compositesb.2017.09.038

Reference: JCOMB 5285

To appear in: *Composites Part B*

Received Date: 2 November 2016

Revised Date: 5 July 2017

Accepted Date: 16 September 2017

Please cite this article as: Zhao L, Li Y, Zhang J, Zhou L, Hu N, A novel material degradation model for unidirectional CFRP composites, *Composites Part B* (2017), doi: 10.1016/j.compositesb.2017.09.038.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

# A novel material degradation model for unidirectional CFRP composites

Libin Zhao[1,*], Yang Li [1], Jianyu Zhang[2,*], Longwei Zhou [1], Ning Hu [2]

1 School of Astronautics, Beihang University, Beijing 100191, China

2 College of Aerospace Engineering, Chongqing University, Chongqing 400044, China

**Abstract**: A novel material degradation model (MDM), which is an essential component of progressive damage models for failure analysis of composite structures, is proposed based on the representative volume element (RVE) method. In this model, a material degradation rule accounting for seven failure modes in a modified Hashin-type failure criterion is proposed. This rule determines the mechanical parameters that are degraded when a failure occurs. The degradation factors of these parameters are calculated from the RVE models for perfect and damaged materials corresponding to the seven failure modes, which are based on the fundamental properties of transverse isotropic fibers and isotropic matrix. To verify the proposed method, the calculated MDMs are used in the progressive failure analyses of open-hole laminates made of three types of CFRP composites under tensile and compressive loadings. Furthermore, the failure analyses of four kinds of double-lap single-bolted joint structures with various layups and geometry dimensions are also conducted under tensile loading. The numerical predictions of failure loads, failure patterns and load-displacement curves are compared to the experimental results. Good agreement between the model predictions and the experimental results demonstrates the effectiveness of the proposed MDM for the progressive damage analyses of open-hole laminates and composite bolted joints.

**Keywords**: A. Laminates; B. Mechanical properties; C. Damage Mechanics; D. Finite element analysis (FEA); E. Joints/joining.

*__Corresponding author:__ Libin Zhao; E-mail: lbzhao@buaa.edu.cn

*__Corresponding author:__ Jianyu Zhang; E-mail: jyzhang@cqu.edu.cn

Download English Version:

https://daneshyari.com/en/article/5021024

Download Persian Version:

https://daneshyari.com/article/5021024

Daneshyari.com