

Accepted Manuscript

A Micromechanics-Based Processing Model for Predicting Residual Stress in Fiber-Reinforced Polymer Matrix Composites

Weijia Chen, Dianyun Zhang

PII: S0263-8223(17)34096-5

DOI: <https://doi.org/10.1016/j.compstruct.2018.07.016>

Reference: COST 9933

To appear in: *Composite Structures*

Received Date: 6 December 2017

Revised Date: 27 March 2018

Accepted Date: 3 July 2018



Please cite this article as: Chen, W., Zhang, D., A Micromechanics-Based Processing Model for Predicting Residual Stress in Fiber-Reinforced Polymer Matrix Composites, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.07.016>

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.

A Micromechanics-Based Processing Model for Predicting Residual Stress in Fiber-Reinforced Polymer Matrix Composites

Weijia Chen^a, Dianyun Zhang^{a,*}

^a*Department of Mechanical Engineering, University of Connecticut, Storrs, CT 06269-3139*

Abstract

An experimentally validated, multi-physics and multi-scale processing model was developed to predict the residual stress buildup in a polymer matrix composite during manufacturing. At the macroscale, the composite was modeled as discrete layers of homogeneous, transversely isotropic laminae, while micromechanics was implemented at the subscale to compute the effective lamina responses based on the fiber and matrix properties through an Extended Concentric Cylinder Assemblage (ECCA) model. The composite temperature and Degree of Cure (DOC) distributions were solved by incorporating resin cure kinetics into heat transfer analysis, which were used in the subsequent stress analysis to determine the cure-dependent composite responses, including cure-dependent modulus, thermal strain, and chemical shrinkage. This integrated processing model was applied to predict the cure-induced warpage of a non-symmetric laminate. The proposed model, which incorporates resin cure kinetics, cure-dependent constitutive law, and tool-

*Corresponding author

Email address: `dianyun.zhang@uconn.edu` (Dianyun Zhang)

Download English Version:

<https://daneshyari.com/en/article/6702486>

Download Persian Version:

<https://daneshyari.com/article/6702486>

[Daneshyari.com](https://daneshyari.com)