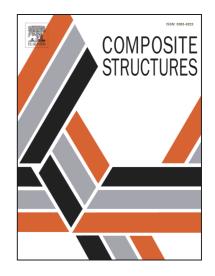
Accepted Manuscript

Virtual curing of textile polymer matrix composites

Royan J. D'Mello, Anthony M. Waas

PII:	S0263-8223(17)31477-0
DOI:	http://dx.doi.org/10.1016/j.compstruct.2017.05.045
Reference:	COST 8554
To appear in:	Composite Structures
Received Date:	9 May 2017
Accepted Date:	17 May 2017



Please cite this article as: D'Mello, R.J., Waas, A.M., Virtual curing of textile polymer matrix composites, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.05.045

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.

Virtual curing of textile polymer matrix composites

Royan J. D'Mello^{*} Research Associate William E. Boeing Department of Aeronautics & Astronautics University of Washington, Seattle, WA 98195-2400, U.S.A

Anthony M. Waas[†]

Boeing-Egtvedt Endowed Chair, Professor of Aerostructures and Chairman William E. Boeing Department of Aeronautics & Astronautics University of Washington, Seattle, WA 98195-2400, U.S.A

Abstract

A homogenization approach to simulate the curing process in textile composites is 6 presented. Internal stresses build-up in a thermosetting polymer matrix during cure because of thermal expansion/contraction mismatch, chemical shrinkage and lack of 8 uniformity in the thermal field. The matrix cures within the fiber tows as well as in q the pockets outside the tows. Although the explicit modeling of each fiber and matrix is 10 preferred, it is computationally prohibitive for tows containing large numbers of fibers. 11 Instead, a homogenization approach that is presented here models the effective curing of 12 the tow by extending the cure hardening instantaneously linear elastic (CHILE) model, 13 originally developed for matrix curing. The possibility of damage and/or failure in the 14 matrix during cure is modeled using the Bažant-Oh crack band model. Using cure 15 parameters for the IM7-8552 material system, the effectiveness of the homogenization 16 procedure is assessed by comparing the curing of a homogenized tow with the curing 17 of discrete fiber-matrix tow, followed by the virtual curing of a 8-harness satin (8HS) 18 weave. Subsequently, the 8HS weave mechanical response is computed. Lastly, the 19 8HS mechanical response when cure induced effects (manufacturing process) are not 20 taken into consideration are assessed. 21

22 23

1

2

3

4

5

Keywords: Curing, stress evolution, textile, satin weave, crack band model

^{*}Email: rjdmello@uw.edu

[†]Author for correspondence – Email: awaas@aa.washington.edu

Download English Version:

https://daneshyari.com/en/article/4911839

Download Persian Version:

https://daneshyari.com/article/4911839

Daneshyari.com